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MICROWAVES IN FOOD PROCESSING

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See also back page

1 E 13
Micro-wave compatible food service products.
Daly, P. N.
Food Technology 25 (9) 918 & 921 (1971) [En] [Litton Ind., Atherton Div., 2530 N. 2nd St. Minneapolis, Minnesota 55411, USA]

The need for product reformulation; development of new food products and/or new packaging techniques; and modification of the microwave oven timer mechanism so that the power profile delivered by the oven meets the exact needs of the product and its container, are briefly discussed in relation to the increasing applications of microwave ovens in all types of food service operations. AB

1 F 55
Sterilizable flexible packaging.
Turtle, B. I.; Alderson, M. G.
Food Manufacture 46 (9) 23-24, 26-27, 29, 31 & 37 (1971) [11 ref. En] [Metal Box Co. Ltd., Res. & Development Dept., 37, Baker Street, London, UK]

The subject is presented under the following headings: compatability, covering materials available and aspects of shelf-life testing, tainting and toxicity; heat processing, covering heat process media, process evaluation and automatic processing equipment; integrity, covering possibility of failure due to poor seals, impacts or puncturing, and biotest procedures; heat sealing and filling, with reference to mechanical resistance during transit and leakage detection and prevention; and marketing aspects, covering of the flexible can and commercial interest in flexible or semi-rigid containers. AB

1 G 19
Frozen confection.
Creswick, N. S. (Unilever Ltd.)
Canadian Patent 876 055 (1971) [En]

A low fat or fat free frozen confection having good texture and stable structure is provided by: whipping an aqueous solution containing heat-coagulable protein solids to form a foam with the protein in the continuous phase; coagulating the protein in the foam by use of electromagnetic radiation in wavelength bands normally used for induction, dielectric and microwave heating for a time sufficient to provide a stable non-rubbery structure in the foam; and freezing the resultant stable foam. IFT

1 J 98
Quick-cooked soybeans.
Anon.
Agricultural Research (Washington) 19 (11) 16-16 (1971) [En]

A 30-50% increase in nutritive value of soybeans has been observed after radiofrequency dielectric heating for about 1 min, raising the beans to a temp. of 280°F. The cooking inactivates a trypsin and erepsin inhibitor which reduces the use of soybean protein. RM

1 J 105
Microwave sterilization of oranges in glass-pack.
Lin, C. C.; Li, C. F.
Journal of Microwave Power 6 (1) 45-47 (1971) [15 ref. En] [Dept. of Food Microbiol., Food Processing Inst., Hsinchu, Taiwan]

Glass jars filled with 230 g conventionally treated orange segments and 110 ml syrup were heat processed either by microwave irradiation at 2450 MHz or 130, 140 or 150 sec, or by placing in water at 87°C for 13 min. pH, sugar content, acidity, ascorbic acid retention and bacterial counts were investigated. Bacterial counts were made 2, 4 and 8 wk after storage at room temp. and at 35°C. It was found that internal temp. of jars was 81, 83.5 and 85°C after 130, 140 and 150 sec irradiation respectively. 140 sec was sufficient to sterilize the packs. Sugar, acidity and ascorbic acid content and pH of the irradiated samples were comparable to that of conventionally sterilized packs. Exposure for 140 sec gave better ascorbic acid retention than conventional sterilization at 87°C. 150 sec exposure gave less retention. PEG

1 M 13
[Vitamins in cereals and cereal products and changes during storage and processing.] [A review]
Miric, M.
Hrana i Ishrana 12 (1/2) 23-30 (1971) [22 ref. Sh, en] [Farmaceutski Fak., Belgrade, Yugoslavia]

This review covers the following topics: loss of vitamins during milling e.g. vitamin B loss at extraction rates <80%; effect of kneading, proofing and baking on vitamins; and influence of heat on vitamins in bread. It is concluded that up to 90% of vitamin activity can be lost during processing of cereals, this is particularly true for vitamin B_1. IN

1 M 22
Measurement of the crystallinity of starches.
Cill, R. A. W.; Rodger, B. W.
Proceedings of the Society for Analytical Chemistry 8 (8) 165 (1971) [1 ref. En] [Imperial Chem. Ind. Ltd., Nobel Div. Stevenston, Ayrshire, UK]

Staling of bread was studied by using a Perkin-Elmer differential scanning calorimeter (DSC) to compare the rate and degree of crystallization of various wheat starch gels. Gels were prepared by heating a starch-water slurry (1:1, w/w) at 80°C in a microwave oven and ageing in sealed polyethylene bags at 25°C for 0, 2, 4, 8 and 21 days. Samples were examined on the DSC by heating at 16°C/min at max. sensitivity. The heat/g starch gel was calculated from the area under each DSC curve. Heats of reversion of 2 similar control (untreated) gels after 21 days were 0.736 and 0.731 cal/g, with an accuracy better than ±6.5% for these gels at 2, 4, 8 and 21 days. Results obtained agreed with those obtained from an amylograph. RM

1 M 103
Rice drying and storage studies.
Calderwood, D. L.
Rice Journal 74 (6) 56 (1971) [En] [Transportation and Facilities Res. Div., USDA, Beaumont, Texas, USA]

The effect of rice temp. of 95-120°F on milling yield, germination, drying rate, fuel requirement and electrical consumption was studied. Using a

continuous flow heated air dryer (retention time 15 min/pass), average drying rates were 1.0 and 2.75% moisture (dry basis)/dryer pass at 95 and 120°F, respectively. Amount of head rice, % germination and fuel consumption were not affected by different drying temp., electrical consumption was less at higher temp. When alternately heating with microwave energy and cooling by aeration, amount of drying was a function of rice temp., which was dependent on length of exposure to microwave energy. Satisfactory milling yields were obtained when rice temp. at each exposure was increased ⩽30°F. 16 heating and cooling periods were required to dry rough rice from 20 to 12% moisture, with 30°F rise in rice temp. each time. After continuous or intermittent aeration (4 h on, 20 h off) and airflow rates of 0.31 and 0.62 ft3/min/cwt, all samples (initial moisture content 16%) were graded number 1 after 280 days of storage. Moisture content dropped 1% in continuously, and ½% in intermittently aerated bins. Average germination % dropped from 86 to 81. Some aflatoxin contamination was found but the concn. was very low. RM

1 R 24
Mollusc processing.
Spracklin, B. W. (United States of America, Department of the Interior)
United States Patent 3 585 676 (1971) [En]

Bivalve molluscs are exposed to microwave radiation in doses of controlled duration and intensity to slightly open their shells so that the flesh can easily be removed. IFT

1 R 25
Mollusc processing.
Hanks, F., Jr.; Grieb, W. C. Jr.
United States Patent 3 594 859 (1971) [En]

The shells of bivalve mollusc are preliminarily opened by heating, then further opened by water sprays. The meat is cut from the shells at or adjacent to its point of attachment, and permitted to fall by gravity to a collection unit, while the empty shells move away in another direction. IFT

1 R 46
The ocean quahog - a bountiful clam.
Mendelsohn, J. M.; Parker, P. S.; McRae, E. D., Jr.; King, F. J.; Joyce, A. H.
Food Product Development 4 (7) 90, 92 & 97 (1971) [10 ref. En] [US Bureau of Commercial Fisheries, Gloucester, Massachusetts, USA]

The potential of the ocean quahog (Articua islandica), a marine clam, as a food resource to substitute for diminishing supplies of bay clams was investigated. Found throughout the N. Atlantic at 18-24 fathoms, surveys indicate potential world harvests at 10%/yr of 300[6] lb of meat. A strong flavour and dark coloured flesh, high processing costs and storage instability have previously prevented their use. By holding fresh clams in chilled sea water prior to opening, the liver, the source of the strong taste, odour and colour, atrophied. Microwave techniques for shell opening and improved refrigeration in storage could make the ocean quahog a versatile resource for preparing clam products. Several recipes are given. SAH

1 S 50
[Changes of poultry meat liqids when processed in an electromagnetic field of ultrahigh frequencies.]
Kuznetsova, Z.; Bol'shakov, A.; Rogov, I.
Myasnaya Industriya SSSR 42 (3) 36-37 (1971) [7 ref. Ru] [Vses. Nauchno-issled. Inst. Ptitsepererabatyvayushchei Promyshlennosti, US

The processing of foodstuffs in an ultrahigh frequency electromagnetic field guarantees a high rate of thermal processing throughout the vol. of the product. Changes in poultry meat lipids (fatty acid content, I_2 number of lipids, haemolytic activity) while heating it in an electromagnetic field to 78-80°C for 40-50 sec were investigated. Heating in an electromagnetic field decreased the content of unsaturated fatty acids and increased the I_2 number less than boiling in water. The nutritive and biological values of poultry meat lipids were not decreased. STI

2 F 77
[Deep-frozen foods: a 'component packaging syst for deep-frozen prepared meals.] Tiefkühlkost: ei "Komponenten-Verpackungssystem" für tiefgekü Fertiggerichts.
Anon.
Ernährungswirtschaft 18 (5) 342-344 (1971) [De]

A description is given of the Sta-Lox modular component system which enables the individual parts of a meal to be selected, since the individual components are separately packaged. T system involves sealable bowls and lids of 2-side plastics-coated paperboard, the use of coatings with different heat resistance properties varying according to the method of reheating (hot water, steam, hot air, mocrowaves, electrical waves, gas). The bowls are conical and hence stackable, and can be made for either individual or multiple portions. IN

2 F 104
[Process for the sterile packaging of bread, particularly sliced bread.] Verfahren zum sterilen Verpacken von Brot, insbesondere von geschnitte Brot.
Modersohn, E.
West German Patent Application 1 586 178 (1971) [De]

Bread, particularly pumpernickel, which has be baked in is heated by high-frequency radiation baked in foil is heated by high-frequency radiation to ~50°C. A plastics film overwrap is then evacuated and simultaneously crimp-sealed t form a pouch. The package is heated to 85°C for sterilization, and is then cooled. W&Co

2 F 121
Precooked food package.
Imperial Chemical Industries Ltd.
British Patent 1 235 971 (1971) [En]

Food is enclosed in a flexible plastics bag with a small quantity of water, ligature partially constricting the bag so that it is divided into 2 compartements, wih he water in the lower compartment. When the water is heated by high frequency energy, it is converted to steam, which passes into the upper compartment to cook the food. IFT

2 G 69
Effect of radio-frequency energy at 60 MHz on food enzyme activity.
Lopez, A.; Baganis, N. A.
Journal of Food Science 36 (6) 911-914 (1971) [22 ref. En] [Dept. of Food Sci. & Tech., Polytechnic Inst., Blacksburg, Virginia 24061, USA]

The effect of ratio-frequency (R-F) energy at 60 MHz on peroxidase, polyphenolase, pectinesterase, catalase and α-amylase activity was determined in water solutions of purified enzymes as well as in apple juice, milk and sweet potato extract. The apparatus used consisted of an R-F generator coupled to an evaporator and condenser. Temp. was kept constant at a desired level by evaporating water from the system. Results showed that while the enzymes were partially or totally inactivated by heat at 70°C, or 65°C in the instance of milk, exposure to R-F energy at 20°C caused essentially no loss of enzyme activity. Within the limits of the experimental conditions, pH and enzyme concn. were not factors in relation to lack of effect of R-F energy on enzymes. Overall, the results indicate that per se, R-F energy at 60 MHz does not have any significant effect on the enzymes studied, apart from that caused by the heat effects of R-F energy. AS

2 J 294
Microwave vs. conventional cooking of vegetables at high altitude.
Bowman, F.; Page, E.; Remmenga, E. E.; Trump, D.
Journal of the American Dietetic Association 58 (5) 427-433 (1971) [20 ref. En] [Dept. of Food Sci. and Nutr., St. Univ., Fort Collins, Colorado, USA]

Effect of microwave, saucepan or pressure cooking at an altitude of 5000 ft on sensory appraisals of colour, flavour, tenderness or texture of fresh vegetables including (i) broccoli, (ii) cabbage, (iii) cauliflower, (iv) onions, (v) Burbank potatoes, (vi) Red McClure potatoes, (vii) spinach, (viii) squash, (ix) zucchini, (x) turnip, and frozen vegetables including (xi) Brussels sprouts, (xii) lima beans, (xiii) peas, (i), (ii), (iii), and (vii) and of wt. on time required to cook vegetables by microwaves was investigated. An analysis of variance of data revealed significance of differences due to cooking method. Mean panel scores were highest for colour of frozen (xi) and (xii) cooked in the microwave range; (ix), frozen (i) and (iv) in the saucepan and (xiii) in the pressure cooker. Mean flavour appraisals were superior for (vi), (xi) or (v) cooked by microwaves; frozen (vii) and (iv). (ix) and frozen (i) by saucepan and (xii) by the pressure cooker. [Continued in following abst.] AS

2 J 295
Microwave vs. conventional cooking of vegetables at high altitude
Bowman, F.; Page, E.; Remmenga, E. E.; Trump, D.
Journal of the American Dietetic Association 58 (5) 427-433 (1971) [20 ref. En]

[Continued from preceding abstr.] Mean tenderness scores were best for (ii), (iii), (x), (xi), (iv) or texture of the last 4 vegetables, (xiii) and (viii) after saucepan cooking. Judges rated tenderness of (v), frozen (i), (xii) and texture of (v) and frozen (i) highest after pressure cooking. Effect of cooking method on acceptability of vegetables was not consistent within or among the vegetables studied. Each method was satisfactory but no single method was consistently best for cooking vegetables at this altitude. AS

2 M 235
Southern Laboratory is studying rice milling.
Matthews, J.; Hogan, J. T.; Mottern, H. H
Deobald, H. J.
Rice Journal 74 (6) 28-30 & 34 (1971) [5 ref. En] [S. Marketing and Nutr. Res. Div., USDA, New Orleans, Louisiana 70119, USA]

Research being carried out at the USDA Southern Research Laboratory on rice breakage is outlined and discussed. An initial study was made of the relative importance of kernel defects (e.g. broken, cracked, chalky, insect-infested and immature kernels) as factors contributing to rice breakage. Breakage occurring during shelling and milling was also studied. Defective kernels were studied by X-ray photography. Correlations were found between: % cracked rough rice kernels and breakage after shelling and milling, % partially-filled hulls † immature kernels and total yield of milled rice, and % chalky kernels and % breakage (Bluebelle rice). Data showed that all cracked kernels do not necessarily break up during milling. Comparisons were made between laboratory and commercial milling equipment. A discussion is included of methods which could possibly change the breakage characteristics of rice e.g. microwave heating of rough rice, heat treatment of rough rice in hermetically sealed containers, treatment of rough rice with NH_3 or SO_2, and pressure cooking of rough rice. RM

2 R 99
[The freeze-drying of shrimps and squid under different conditions of heating (micro-waves, contact plates, infra-red rays).]
Aglio, G. dall'; Porretta, A.; Versitano, A.
Industria Conserve 46 (2) 93-100 (1971) [25 ref. It, fr, en, de] [Sta. Sperimentale per l'Ind. delle Conserve Alimentari, Parma, Italy]

Freeze-drying of shrimps and squid was carried out using 3 types of apparatus: (i) using IR; (ii) using microwaves; (iii) using contact heating plates. The fresh materials were washed, and cleaned in boiling water containing 3% salt for 25 min after being cooked. They were then frozen at -25° to -20°C for ~2 h. The squid froze more quickly than the shrimps. They were then freeze-dried and kept at ambient temp. The following

analyses were carried out on the fresh and freeze-dried materials: dry residue; moisture content; metallic content (Na, K, Fe); free amino acids; rehydratability, by immersion and agitation in water at 20°C and 100°C; and organoleptic qualities of rehydrated products. Results showed that method (ii) was the most important practically. The time required for freeze-drying could be considerably reduced (by ⅛ and ¼ compared with (i) and (iii) respectively) using this method without any modification of the chemical or organoleptic properties of the foodstuffs. With all 3 methods there was substantial lo amino acids and inorganic salts from freeze-dried products compared with fresh materials. The freeze-dried products were much more stable to storage than the fresh materials thus showing the economic importance of the freeze-drying process. LA

2 S 161
Precooked poultry product.
Jeppson, M. R.; Rogers, C. J. (Cryodry Corp.)
United States Patent 3 597 228 (1971) [En]
A precooked poultry product which can be stored under refrigeration and prepared for serving by a brief reheating is prepared by a combination of microwave, steam and oil cooking. IFT

2 S 185
Precooking and reheating of turkey.
Cipra, J. E.; Bowers, J. A.; Hooper, A. S.
Journal of the American Dietetic Association 58 (1) 38-40 (1971) [6 ref. En] [Dept. of Foods and Nutr., St. Univ., Manhattan, Kansas, USA]
Total cooking and reheating times were significantly less for meat cooked in a microwave oven than for that cooked in a conventional gas oven. Total cooking losses were significantly greater after microwave cooking and reheating. Losses due to evaporation were higher for microwave-heated meat, but drip losses were greater for meat cooked in the gas oven. Percentages of both expressible and total moisture were significantly lower for meat cooked by microwaves than for meat cooked in the gas oven. More intense turkey flavour and less stale flavour resulted from meat cooked by microwave than by gas. There were no significant differences between methods for pH, colour, juiciness or tenderness. Results of this study indicated that the principal advantages of microwave precooking and reheating of turkey were shorter cooking time and decreased stale flavour of meat. AS

3 A 135
Dielectric properties of food at 3 GHz as determined by a cavity perturbation technique. I. Measuring technique.
Risman, P. O.; Bengtsson, N. E.
Journal of Microwave Power 6 (2) 101-106 (1971) [4 ref. En] [Husqvarna Vapenfabriks AB, Electronic Div., S-561 01 Huskvarna, Sweden]
After a preliminary study of various methods for dielectric measurements described in the literature, a cavity perturbation method was chosen and developed for measurements of food materials at 3 GHz. A cylindrical TMO10-cavity was designed for measurements on low-loss materials and a TMO12-cavity for materials of high loss. Both permit favourable sample dimensions, simple insertion of samples in glass or quartz tubes, and rapid measurements of a number of replicates. The dielectric constant and loss factor are calculated from the shift in resonant frequency and Q-value or transmission between empty and filled sample tubes. [See also following abstr.] AS

3 A 136
Dielectric properties of foods at 3 GHz as determined by a cavity perturbation technique. II. Measurements on food materials.
Bengtsson, N. E.; Risman, P. O.
Journal of Microwave Power 6 (2) 107-123 (1971) [12 ref. En] [Swedish Inst. for Food Preservation Res. (SIK), Pack. S-400 21 Göteborg, Sweden]
A series of measurements of dielectric properties for food materials were made in the temp. range -20 to +60 C using the cavity perturbation technique described in the first paper of this series. Variables studied besides temp. were preparation technique, pretreatment and composition of the food materials. Results obtained were consistent, reproducible and in fair agreement with the literature data available. For moist foods a very sharp rise in dielectric properties is seen during thawing, followed by a gradual decrease with further temp. increase, except for salted foods where a continued increase in loss factor with temp. was found. A clear positive correlation between water content and ε'_r was found but not for ε''_r. [See also preceding abstr.] AS

3 E 113
[High frequency freeze drying equipment for food products.]
Kocherga, S. I.; Boim, B. M.; Voskoboinikov, V.
Konservnaya i Ovoshchesushil'naya Promyshlen 1971 (4) 31-32 (1971) [Ru] [Vses. Nauchno-issled. Inst. Konservnoi i Ovoshchesushil'noi Promyshlennosti, USSR]
The drying chamber of a freeze drier can be heated by radiation, conduction or dielectric source. High frequency heating using a high frequency current generator with a frequency of MHz was tested under operational conditions to accelerate the drying process. A high potential immobile electrode measuring 150 × 150 mm is mounted in the drying chamber. The max. outpu the electron generator is 4 kW, the working frequency 40.68 MHz, the specific anode current value 1,2 A, the lattice current 0.3-0.5 A. The working pressure in the drying chamber is kept automatically at 10-100 N/m², the temp. in the spiral condenser at a max. of -25°C. The DM is applied in a thin layer on the mobile lattice valve; its movement is controlled by a mechanism outside the chamber. If a frequency under 100 MHz is used, a corona discharge is created in the chamber, starting the defreezing of the product and increasing the dielectric and overall energy losses. The high potential electrode was, therefore, covered by a 6 mm thick die eliminate the corona. A very simplified scheme of the equipment is included. STI

3 F 177
Fork-n-seal Aust. Pty Ltd., Australian agents for new "lectraseal" closures.
Anon.
Australian Food Manufacture 41 (1) 16 (1971) [En]
The 'lectraseal' process makes use of radio frequency waves to heat-seal plastics coated Al foil membranes across the mouths of glass or plastics containers. This provides a hermetic seal, thereby making the container particularly suitable for hygroscopic products and freeze-dried or precooled foods. Applications of 'lectraseal' with snap-on closures, screw-on closures and pre-formed skirted foil caps are briefly outlined, e.g. instant coffee packaging. BFMIRA

3 G 125
Systems widen institutional-food market.
Anon.
Modern Packaging 44 (9) 36-38 (1971) [En]
The potential growth of the institutional feeding market is discussed, particularly as applied to school lunches. At present only 6% of school meals in the USA are individually prepackaged; this offers considerable possibilities for a single portion institutional package, with concomitant reduction in labour and waste. Examples quated are formed expanded polystyrene or Al trays for hot foods, and clear formed polystyrene for cold foods. Hot meals can be reheated to the correct temp. in microwave or convection ovens, while empty trays can be returned to the supplier for disposal. RPC

3 J 339
[Microwaves in food production.] Mikrowellen in der Lebensmittelproduktion.
Ernährungswirtschaft 18 (6) 383 (1971) [1 ref. De]
Anon.
Manufacture of potato crisps is used to illustrate the use of microwaves (915 and 2450 MHz) in the food industry. The crisps are dried without affecting the colour of the final product. In a microwave oven at 2450 MHz, a 30-35 sec drying time is sufficient to produce crips with the desired colour and a sufficiently low moisturecontent. Potatoes with a high reducing sugar content can be processed without excessive browning. The fat content of the final product is always less than with crisps produced by other methods. The loss factor with the microwave method is a function of the moisture content of the product and the wavelenght applied; it is minimal at <20% moisture and 3000 MHz. Areas offering scope for development are in freeze-drying and in sterilization, e.g. of milk. IN

3 P 279
Prediction on the relative dielectric loss factor in aqueous solutions of nonfat dried milk through chemical simulation.
Mudgett, R. E.; Smith, A. C.; Wang, D. I. C Goldblith, S. A.
Journal of Food Science 36 (6) 915-918 (1971) [21 ref. En] [Dept. of Nutr. & Food Sci., Inst. of Tech., Cambridge, Massachusetts 0213h, USA]
The possibility of estimating the heating characteristics of foods for a variety of microwave processing applications was investigated in this study of the relative dielectric loss factor in aqueous solutions of dried skim-milk and chemically simulated milk. Milk dielectric loss was found to be substantially lower than values predicted from a knowledge of chemical composition. Milk analogues were prepared over a wide range of concn. (g/100 ml): NaCl, 0.5-2.0; sodium caseinate, 1.5-6.0; and lactose, 2.5-10.0; and compared with dried skim-milk concn. of 4.5-18.0 g/100 ml. Standing wave measurements were made at 25°C and a frequency of 3000 MHz using the method of Pace, Westphal and Goldblith [J. Fd. Sc. (1968) 33: 30 & 37]. SAC

3 R 151
[Foam drying techniques of food by microwave heating. IX. Foam drying of protein food (3). Foam drying method of fish protein. Raw materials (B) [A lecture]
Tsuyuki, H.; Shuto, A.
Food Industry [Shokuhin Kogyo] 13 (14) 73-80 (1970) [2 ref. Ja] [Fac. of Agric. & Vet. Med., Nihon Univ., Setagaya-ku, Tokyo, Japan]
The ratio of soy protein, wheat gluten and egg protein to fish protein such as sardine, mackerel and bonito was studied for foam drying of fish protein. Dough was prepared with a mixture of potato starch and fish meat (30:100) and water, to which was added 3% soy protein and 2% wheat gluten. [See Fd Ind. Tokyo (1970) 13 (12) 66 for part A.] HS

3 R 152
[Foam drying techniques of food by microwave heating X. Foam drying of protein food (4). Foam drying method of fish protein. Raw materials [C).] [A lecture]
Tsuyuki, H.; Shuto, A.
Food Industry [Shokuhin Kogyo] 13 (16) 67-74 (1970) [3 ref. Ja]
Foam dried fish protein was prepared from fish meats having a low fat content such as sauryp ike, turbot and sillago. Ingreadients were (% vw. fish meat): potato starch 30%; soy protein 3%; wheat gluten 2%; egg yolk 2%; salt, sugar and cellulose. [See preceding abstr. for part B.] HS

3 R 153
[Foam drying techniques of food by microwave heating. XII. Foam drying of protein food (6). Foam drying method of fish protein. Raw materials (E).] [A lecture]
Tsuyuki, H.; Shuto, A.
Food Industry [Shokuhin Kogyo] 13 (20) 81-88 (1970) [4 ref. Ja]
30 kg frozen cod meat was kneaded with 9 kg potato starch, 0.9 kg soy protein, 0.3 kg wheat gluten, 0.6 kg egg white and 0.9 kg salt, and then steamed at 90°C for 150 sec, dried for 2 h at 50°C and finally foam-dried by microwave. Total production cost of foam dried fish protein was 456-493 yen/kg ($1.40-1.60/kg), according to the grade of fish meat. [See Fd Ind. Tokyo (1970) 13 (18) 77-88 for part D.] HS

4 C 82
Microwave ovens and their public health significance.
Elder, R. L.; Goldblith, W. E.
Journal of Milk and Food Technology 34 (9) 444-446 (1971) [9 ref. En] [Public Health Service, Bureau of Radiological Health, Rockville Maryland 20852, USA]

The number of microwave ovens sold in the USA is expected to increase over the next 2-3 yr. Recent field surveys have indicated that proper maintenance on the part of the owner-operator and improved servicing practices play an important role in controlling microwave oven leakage. The Department of Health, Education, and Welfare performance standard for microwave ovens, which applies to ovens manufactured after October 6, 1971, cannot be truly effective unless the ovens are conscientiously maintained after purchase. The sanitarian has an extremely important role in promoting microwave oven safety, and State and local health workers are urged to take an active part in convincing owners to implement proper maintenance procedures and to practice good sanitation. AS

4 E 140
Advances in Europe.
Woollen, A. H.
Food Engineering **43** (11) 75-78 (1971) [En]

Advances described include: successful continuous baking of bread using a combination of microwave and thermal energy - a 1 lb white loaf can be baked in 4 min; new continuous mixer using rapid oscillation of solid balls in a fixed spiral inside a vertical tube; retortable pouch which allows boil-in-the-bag vegetables to be pre-cooked in the bag at the factory; new freezers for producing 'store and pour' forms of frozen liquid and pureed materials such as chopped spinach, egg and soups; continuous density measurement without mechanical contact, with a device using γ-rays from a ^{60}Co or ^{137}Cs source - potential applications include monitoring the sugar content of syrups and fruit juices; new system for mechanical shelling of cashew nuts; fully-automatic frozen fish stick unscrambling, collating and cartoning line; direct steam injection for sterilization of molasses; and a simple method of extracting both high quality oil and protein from fresh coconut. AB

4 E 160
Selective cooking apparatus.
Stevenson, P. N. (Teckton Inc.)
United States Patent 3 615 713 (1971) [En]

Various foods constituting a meal are each contained in separate containers for the purpose of cooking in a microwave oven. The individual containers are constructed so that different degrees of radiation are applied to the foods contained therein, thereby allowing the cooking of a complete meal at one time. IFT

4 M 408
Microwave baking process.
Hoynak, P. X. (CPC International Inc.)
United States Patent 3 615 683 (1971) [En]

The process is based on the absence of colour development when cake formulations containing dextrose are baked in a microwave oven. IFT

4 M 477
Flour milling process.
Watkins, H. E. (Pet Inc.)
United States Patent 3 620 764 (1971) [En]

The functional characteristics of flour produced from cereal grains are controlled by treating the grain prior to milling with microwave energy under controlled conditions of time, moisture, power, temp. and frequency. IFT

4 R 176
Oyster processing.
McMillan, D. C. (Olympia Oyster Co.)
United States Patent 3 615 726 (1971) [En]

Oysters are prepared for refrigerated storage by use of radiant energy in the microwave spectrum to pasteurize and seal them without raising the temp. above 170°F, thereby retaining the original firmness and taste. IFT

4 R 177
Shellfish processing.
Henry, M. T. (Interchemical Corp.)
United States Patent 3 614 806 (1971) [En]

Oysters are exposed to microwaves and oxyacetylene heat to open the shellfish and detach it from the shell. IFT

4 R 178
Seafood processing.
Gillies, M. T.
Food Processing Review. Noyes Data Corporation 22 vii + 206pp. ISBN 0 8155 0392 X (1971) [En]
Park Ridge, New Jersey, USA: Noyes Data Corp. Price $36.00

This book is based on US patents issued since 1960 and related to seafood processing. The book serves a double purpose in that it supplies detailed technical information and can be used as a guide to US patent literature in this field. Legalistic patent phraseology has been eliminated. Information is arranged under the following chapter headings: Preservation (pp. 3-30) by refrigeration, chemical methods, edible coatings, irradiation and microwaves; Canning procedures (pp. 31-60) for tuna and related spp. and sardines, and prevention of struvite; Fish protein concentrates (pp. 61-109), covering preparation by physical, chemical and biological means and preparation from stickwater. Molluscs and shellfish (pp. 110-145), covering squid, bivalves and crustaceans; Consumer products (pp. 146-182), including frozen seafoods, snack items

freeze-dried products, heat coagulable material for cake mixes, flavouring materials and batter-coated seafoods; and Animal foods (pp. 193-201). The table of contents is arranged in such a manner as to serve as a subject index. Company, inventor and patent number indexes are included. JA

4 R 197
Destruction of salmonellae by microwave heating of fish with implications for fish products.
Baldwin, R. E.; Fields, M. L.; Poon, W. C.; Korschgen, B.
Journal of Milk and Food Technology **34** (10) 467-470 (1971) [13 ref. En] [Dept. of Food Sci. and Nutr., Univ., Columbia, Missouri 65201, USA]

Since salmonellae are potential contaminants of fish, this study was undertaken to determine the adequacy of microwave heating for destruction of this microorganism. Exposure of 270 g portions of carp to microwaves (2450 MHz) for 195 sec was not adequate for complete destruction of Salm. typhimurium ATCC 6994 or Salm. typhimurium ATCC 13311 inoculated on the surface of the fish. One-serving portions of tuna pies, tuna casseroles, fish fillets, and fish sticks required 49-390 sec to achieve a lethal temp. of 55°C when heated by microwaves. Under normal usage of electronic ranges one-serving portions of food would not be heated for as long as 390 sec. AS

4 S 442
Microwave drying of carcass samples from experimental lambs.
Reveron, A. E.; Gelman, A. E.; Topps, J. H.
Laboratory Practice **20** (12) 943-945 (1971) [6 ref. En, fr, de] [School of Agric., Univ., 581 King Street, Aberdeen, UK]

For drying large numbers of samples from carcasses for determination of moisture content and preparation for analysis, freeze drying is commonly used to avoid loss of substances other than water, but is extremely slow. Comparative trials were made with the much more rapid microwave drying, using samples of either whole minced carcass material or major organs taken from 10 lambs. Six 50-g amounts from each lamb were dried in a microwave cooker for 60 or 80 min in 6 or 8 heating cycles of 10 min, internal temp. 70-85°C; six 30-g amounts were also freeze dried for 24 h. Fat (by extraction), protein (Kjeldahl) and ash (ignition) were determined in triplicate. DM contents at constant wt. for microwave and freeze drying respectively were (%): carcasses 40.7-59.8, 40.6-58.0; organs 34.2-44.9, 34.1-42.3. Mean values for the 3 components were almost identical for the 2 drying methods, except that lower fat values were obtained with microwave drying of samples with high fat content, indicating some small loss by volatilization. Microwave drying did not affect the iodine number but significantly increased the peroxide value of the fat, due to oxidation. ELC

5 C 119
The health hazards of microwaves with special reference to microwave ovens.
Tilton, R. C.
Quarterly Bulletin of the Association of Food and Drug Officials of the United States **35** (4) 271-275 (1971) [8 ref. En] [Dept. of Lab. Med., Univ., School of Med., Farmington, Connecitut, USA]

Most ovens generate microwaves by the use of a magnetron tube and fall within the frequency range 2450 MHz/sec. In order to assess whether microwaves are a domestic hazard, their thermal and non-thermal effects on biological material are considered. Exposure criteria (>10 mW/cm^2 potentially hazardous, 1-10 mW/cm^2 safe for occasional exposure, <1 mW/cm^2 safe for indefinitely prolonged exposure) are considered. Studies on microwave hazards are reported. It is concluded that the health hazard is not continuous but is dependent on the possible malfunction of the safety interlock on the door which would permit the oven to be started with the door open and also possible leakage around the door gaskets. VJG

5 E 205
Dehydration process.
Futer, R. E.
British Patent 1 247 324 (1971) [En]

In a dehydration process, food pieces are subjected to microwave energy in the presence of a moving gas current to remove surface moisture. IFT

5 F 242
[Process and package for cooking food products.]
Verfahren zum Garen von Nahrungsmitteln und Nahrungsmittelpackung zur Durchführung des Verfahrens.
Löhnert, W.
West German Patent Application 1 692 154 (1971) [De]

Deep-frozen food products are packaged in sealed plastics film pouches or in containers closed with a plastics film which is heat- and water-proof at the cooking temp. Cooking may be carried out in a water bath, a microwave oven etc., the film being sufficiently steam-permeable to prevent breakage. The aroma is retained. W&Co

5 M 527
Puffed barley.
R. & W. Paul (Maltsters) Ltd.
British Patent 1 248 655 (1971) [En]

Barley is irradiated with electromagnetic radiation at 30-80 mega-cycles/sec to burst the endosperm structure. IFT

5 M 540
[Method for manufacturing a farinaceous product based on wheat flour.]
Unilever NV
Netherlands Patent Application 7 106 629 (1971) [Nl]

Pasta products, particularly vermicelli and spaghetti, are made by drying a green wheat flour dough in 2 steps. The dough is first allowed to dry in a controlled atm. to a 25% moisture content; it is then dried to a final moisture content of 8-13% by microwave energy, which simultaneously, to some degree, gelatinizes the starch, and removes evaporating moisture in a stream of a dry gas. The microwave energy is 10-100 W/h, preferably 30 W/h. Accelerated drying is achieved without formation of the hard, brittle shell which leads to a sticky, turbid cooked product. W&Co

5 M 580
Dough proofing.
Schiffmann, R. F.; Stein, E. W.; Kaufman, H. B., Jr. (DCA Food Industries Inc.)
United States Patent 3 630 755 (1971) [En]
In a method for proofing cut pieces of yeast-containing dough, the pieces are subjected to ≥2 microwave heating periods separated by a rest period to permit temp. equilibration. IFT

5 M 582
Fried bakery products.
Schiffmann, R. F.; Roth, H.; Lipka, D. H.; Goodman, A. H. (DCA Food Industries)
United States Patent 3 633 490 (1972) [En]
Apparatus is described for preparing fried bakery products, such as doughnuts, in which a partially deep-fried dough piece is subjected to microwave energy to cook the uppermost side. IFT

5 P 618
[Use of ultra-high frequency electromagnetic oscillations for the treatment of milk and water. (In "Proceedings of Inter-University Dairy Conference".)] In "Sbornik dokladov mezhvuzovskoi konferentsii po molochnomu delu". Chernova, A.
pp. 389-392 (1971) [14 ref. Ru] Erevan, USSR: Izdatel'stvo Aiastan [Saratovskii Zootekhnicheskovet. Inst., USSR]
A continuously operating magnetron generating 2375 MHz (2.5 kWh) was used for the pasteurization of milk, generally at 76-86°C with 7-8 sec holding. The treatment had no adverse effects on organoleptic properties and composition of the milk, and on its suitability for processing into milk products. Cultured milks made from the treated milk had the same organoleptic, antibiotic and other properties as products made from conventionally pasteurized milk. The recovery of butterfat in buttermaking was increased when the cream was subjected to this treatment. Subjecting water to the treatment for a period of 15 sec is reported to be effective in destroying bacteria, including spore-formers. FL

5 P 717
[Optimal frequency of high frequency currents for rapid defrosting of butter.]
Klepacki, J.
Roczniki Instytutu Przemyslu Mleczarskiego **13** (1) 55-70 (1971) [9 ref. Pl, ru, en] [Inst. Przemyslu Mleczarskiego, Warsaw, Poland]
It is calculated from the findings reported in an earlier paper [FSTA (1971) **3** 12P2034] and from further experiments under conditions described there that the 63 MHz band represents optimal frequency for defrosting butter at -5°C by high frequency currents. It is pointed out that in view of the possible reduction of defrosting time from ~4 days in the conventional method to a few min in the dielectric method, relatively large errors in calculation of defrosting time in the latter method would be equivalent to only a negligible error in the former. SKK

5 R 261
Investigation of some methods of fish thawing.
Piskarev, A. I.; Krylov, G. I.; Lukyanitsa, L. G.
Proceedings of the International Congress of Refrigeration (12th Madrid) **3**: 285-290 (1967, publ. 1969) [2 ref. En, fr] [Sci. Res. Inst. of Refrigeration Ind., Moscow, USSR]
Histological examination of frozen fish muscular tissue, thawed by high frequency treatment, immersion in water at 5° or 25°C or in air at 5° or 20°C, showed that the tissue did not return to its initial structure after freezing. The effects were more pronounced in lean than in fat fish. The hydrophylic properties of the fish muscle were also altered after freezing and thawing. No significant effect of thawing conditions on the organoleptic properties of the fish was observed. MEG

5 S 636
Flavour changes in reheated chicken.
Harris, N. D.; Lindsay, R. C.
Journal of Food Science **37** (1) 19-22 (1972) [31 ref. En] [Dept. of Food Sci., Univ., Madison, Wisconsin 53706, USA]
The flavour of breaded chicken thighs precooked in a microwave oven and reheated a short time by deep-fat frying was judged better than the flavour of similar samples which were deep-fat fried and later reheated in a microwave oven. Off flavours associated with reheating developed within 2 h after initial cooking. The flavour scores of precooked chicken did not change significantly between 1 and 5 days of refrigerated storage. However, thiobarbituric acid numbers increased during refrigerated storage. Reheating samples by either method employed caused an increase in levels of free fatty acids. Total monocarbonyl compound levels were higher in reheated samples and members of the 2,4-dienal class were not observed. IFT

6 F 287
Container has unique features.
Anon.
Food Processing **33** (1) 35 (1972) [En]

A line of polyethylene food containers has liquid tightness because of 3 contact points between the lid and container, a small slot moulded into the cover to allow entrapped air and other gases to escape, a large flange on the cover to allow for off-side alignment on the filling line, and 8 projections (lugs) to prevent sticking of stacks of containers. The containers can be blast frozen, defrosted in hot water, heated by microwave, and heated up to 500°F for short periods. PG

6 L 456
[Heat treatment of foods: observations on heating of honey.] Thermische Stoffbehandlung: Betrachtungen zur Honigerwärmung.
Bergel, C.; Stuwe, G.
Ernährungswirtschaft **18** (11) 848, 850, 852 & 857-861 (1971) [12 ref. De] [Edeka-Zentrale GmbH, Hamburg, German Federal Republic]

Conventional heating by conduction leads to changes in the constituents of honey as a result of the protracted heating times. With dielectric heating in 500-g jars 1.5-2 min are sufficient to heat the honey from 20° to 55-57°C, and no changes occur in the diastase number or the hydroxymethylfurfural content. An hourly throughput of 1000 kg honey requires 20 kW (high frequency current) to heat from 30° to 50°C and 25 kW to 55°C. If the current is taken from the mains supply, the requirements are approx. doubled, as high-frequency heaters have only ~50% efficiency. IN

6 M 605
Microwave processing of pasta.
Maurer, R. L.; Tremblay, M. R.; Chadwick, E. A.
Food Technology **25** (12) 1244-1246 & 1249 (1971) [En] [Thomas J. Lipton Ltd., 307 Orenda Rd., Bramalea, Ontario, Canada]

A plant for the microwave processing of pasta is described. The noodles are first briefly dried in a shaker drier to remove a small % of the water so that the noodles will not clump together. They are then placed on a perforated nylon or nomex belt which carries them through the microwave chamber in a single pass; the exposure time is ~10 min and hot air is forced through the chamber to carry off the moisture as it is liberated. From the microwave oven, the noodles are transported via a vertical conveyor to a cooler and from there to holding tanks prior to packaging. AB

6 M 707
Microwave oven occupies 75% less floor space - dries 2000 lb pasta/h, cuts process time 95%.
Maurer, R. L.; Tremblay, M. R.; Chadwick, E. A.
Food Processing **33** (1) 18-19 (1972) [En] [Thomas J. Lipton, Ltd., Bramalea, Ontario, Canada]

Trials made using a microwave oven to dry small noodles for dried soups that would cook faster when rehydrated showed that the pasta remained soft and "checking" was avoided. Colour was lighter and more yellow than that produced in conventional drying equipment. The higher final temp. produced by the microwave oven (150°F) has a pasteurizing effect which virtually eliminates bacterial growth. Noodles are carried on continuous nylon composition belts through a resonating cavity-type oven with an output at 915 MHz of 25 000 W. Capital cost of microwave drying equipment is similar to that of conventional equipment, though maintenance costs and space requirements are lower. PG

6 P 968
[Use of high frequency currents for rapid defrosting of butter.]
Klepacki, J.
Roczniki Instytutu Przemyslu Mleczarskiego **13** (3) 39-51 (1971) [7 ref. Pl, ru, en] [Inst. Przemyslu Mleczarskiego, Warsaw, Poland]

Experiments on dielectric defrosting from -16° or -18°C to 2-4°C of butter were carried out on (i) laboratory scale using 250 g prints of butter and a high frequency generator operating at 6-60 MHz with 100 W output and (ii) semi-industrial scale using 10-15 kg blocks of butter and a 27.12 MHz generator with 3 kW output coupled to a heating chamber. Best conditions for (i) were at 50 MHz and a defrosting time of 6 min. which required and input of 300 V/cm. In (ii) defrosting time ranged from 10 to 15 min. Current costs are estimated at 0.09 zloty/kg and total costs at 300 zloty/metric ton. [See FSTA (1972) **4** 5P717.] SKK

6 S 704
Flavour of microwave- and conventionally-reheated turkey.
Cipra, J. S.; Bowers, J. A.
Poultry Science **50** (3) 703-706 (1971) [10 ref. En] [Dept. of Food & Nutr., St. Univ., Manhattan, Kansas 66502, USA]

Flavour, aroma, and juiciness of precooked frozen turkey reheated in microwave and conventional gas ovens were evaluated by experienced panelists. % ether extractable material and moisture were determined and results compared with organoleptic evaluations. Stale, aldehyde-like aroma was more intense ($P<0.01$) in light turkey meat reheated by gas than by microwave; stale aroma was more intense in light than dark meat. Meaty-brothy flavour and aroma were more intense in microwave- than gas-reheated meat and in dark ($P<0.01$) than light meat. S flavour and aroma were detected in microwave-reheated dark meat and sweet flavour and aroma in light meat reheated by the same method. Often microwave-reheated light meat was flat or bland flavoured. Meat reheated in the gas oven had higher juiciness scores than did that reheated by microwaves. Conventionally-reheated turkey had a greater % moisture ($P<0.01$) than meat reheated by microwaves. % ether extractable material was similar for the 2 reheating methods. AS

6 S 783
[The practice of thawing.] Die Praxis des Auftauens.
Heinz, G.
Fleischerei **23** (2) 31-32 & 34 (1972) [De, en, fr] [Bundesanstalt für Fleischforschung, Kulmbach, German Federal Republic]

Thawing of frozen meat with either air or H_2O, or microwaves is described and compared. For thawing of beef quarters an air temp. of 14-15°C and flow rate of 2 m/sec is recommended, with reduction of room temp. to 4°C 3-4 h before the end of thawing to prevent bacterial multiplication. If H_2O is used as thawing medium a temp. of 10-15°C is recommended; H_2O temp. >40°C must be avoided to prevent denaturation of protein; wt. losses are eliminated but the danger of cross-contamination is greater, and some protein, H_2O-soluble vitamins and minerals are washed out; discoloration may also occur. H_2O thawing is therefore not preferred to air thawing except in the case of vacuum-packed pieces. Use of microwaves lacks uniform temp. distribution over the entire surface and has a penetration rate to ~12 cm; good quality is retained and wt. losses minimized because of the short exposure; thawing to just <0°C, with completion by conventional methods, is recomended. Processing of boneless beef of 5 cm thickness in its frozen state, or air thawing at saturated humidity to minimize wt. losses is advocated. OA

7 E 289
[Selected applications of microwaves in the food industry.]
Kierebinski, C.
Przemysl Spozywczy **26** (1) 6-9 (1972) [Pl, en, ru, fr, de]

The mechanics of microwave heating are discussed generally, and specific applications of microwaves for food industrial purposes are quoted. These include: thawing of frozen or cold-stored products (meat, fish, fruit), with particular reference to reduction of thaw drip and loss of flavour; thawing and heating of ready-to-serve meals, and cooking (roasting, frying etc.) of poultry, chips, bacon; and vacuum drying of grain and vegetable and animal extracts. HBr

7 J 1136
Heating and drying peanuts with radio frequency energy.
Wright, M. E.; Porterfield, J. G.
Transactions. American Society of Agricultural Engineers **14** (4) 629-633 & 637 (1971) [14 ref. En] [Agric. Eng. Dept., Virginia Polytechnic Inst. & St. Univ., Blacksburg, USA]

The use of dielectric heating for uniform drying of peanuts is investigated, using peanuts of 0, 13.6, 31.6 and 56.2% moisture contents in order to (i) determine the power absorption of peanuts in a radio-frequency field of fixed frequency as a function of moisture content, vol. of peanut material per packed vol. of heating chamber, characteristic length of peanuts parallel to the electric field and electric field strength; (ii) to develop a prediction equation for the rate of drying peanuts in a conventional batch-type forced air drying system based on initial moisture content, conditions of incoming air and power absorption from a radio-frequency field impressed on the sample. RM

7 J 1237
Rapid improvement in nutritional quality of soybeans by dielectric heating.
Borchers, R.; Manage, L. D.; Nelson, S. O.; Stetson, L. E.
Journal of Food Science **37** (2) 333-334 (1972) [10 ref. En] [Dept. of Biochem. & Nutr., Univ. of Nebraska, Lincoln, 68503, USA]

Treatment of raw, air-dried whole soybeans in a radiofrequency dielectric heater developed full nutritive value of the soybeans in <2 min of treatment. The nutritive value was assayed by rat feeding tests. The indices of heat treatment of soybeans showed the usual decrease in protein solubility, inactivation of urease and inactivation of trypsin inhibitor activity. Browning developed during dielectric treatment but to a lesser extent than in steam autoclaving of soybeans. IFT

7 L 549
Dielectric properties of carbohydrate-water mixtures at microwave frequencies.
Roebuck, B. D.; Goldblith, S. A.; Westphal, W. B.
Journal of Food Science **37** (2) 199-204 (1972) [31 ref. En] [Dept. of Nutr. & Food Sci., Massachusetts Inst. of Tech., Cambridge, 02139, USA]

The dielectric properties (dielectric constant κ' and dielectric loss factor κ'' of granular potato starch- and gelatinized potato starch-water mixtures were measured at 1.0 giga-Hz and 3.0 giga-Hz at 25°C. For mixtures of <20-30% water, κ' and κ'' showed little dependence upon the water content and no frequency dependence. Granular potato starch-water mixtures >30% water and gelatinized potato starch-water mixtures >20% water showed sharp increases in their dielectric properties at both 1.0 giga-Hz and 3.0 giga-Hz. At both frequencies, κ' of granular and gelatinized potato starch-water mixtures decreased from the κ' of water as the water content decreased from 100% to 40%. At both frequencies, κ'' of both potato starch mixtures increased from the κ'' of water as the water content decreased, reaching a max. value at 45% and then declining rapidly as the water content decreased. The gelatinized potato starch-water mixtures showed a larger κ'' value than the granular potato starch-water mixture of the same concn. Qualitative interpretation of the dielectric properties of these mixtures was based upon the behaviour of water at microwave frequencies. IFT

7 L 564
[Absorption of microwaves by impure sugar solutions.]
Valter, V.; Havlin, A.; Anton, K.
Listy Cukrovarnicke **87** (12) 283-287 (1971) [8 ref. Cs, en, de, ru] [Vyzkumny Ustav Cukrovarnicky, Prague-Modrany, Czechoslovakia]

The water content of sugar can be indirectly measured by measuring microwave attenuation. This technique was used for determination of water in molasses or of supersaturation of molasses. In supersaturated molasses the attenuation of microwaves proceeds in a linear relation to temp. and water concn. The relation of wave attenuation to concn. was more apparent in undersaturated than in supersaturated molasses. This may be utilized for determining the degree of molasses saturation. Changes in crystal concn. in massecuites within the limits common for second stage massecuites did not affect wave attenuation. STI

7 S 818
[The thawing-out of frozen meat.] Auftauen von gefrorenem Fleisch.
Heinz, G.
Kälte- und Klima-Rundschau **10** (1) 9-13 (1972) [De] [Bundesanstalt für Fleischforschung, Kulmbach, German Federal Republic]

Thawing-out of frozen meat is discussed under the headings of: forms of frozen meat for the consumer market; storage of frozen meat; hygienic and physico-chemical aspects of thawing-out; thawing-out of beef quarters, other carcasses, and boned meat, and the effect thereon of ambient air, pre-conditioned air of constant temp. and high humidity, H_2O at different temp., and of microwaves. Recent investigations have shown that max. stability of meat without reduction in quality is: beef, 3 months at -10°C, 12 months at -20°C, and >24 months at -30°C; pork, 2 months at -10°C, 7 months at -20°C, 18 months at -30°C; chicken, 3 months at -10°C, 10 months at -20°C, 24 months at -30°C; and game, 6 months at -18°C. It was concluded that optimal temp. must be determined in relation to the physical size of meat, degree of ambient temp., and probable degree of bacterial multiplication in a given time; that the wt. losses in thawing-out are relative to the humidity of the environment, and relative to the mode of processing of the meat before freezing, and the freezing process per se. Meat intended for further processing into meat products should be graded according to quality and size prior to freezing, so that it can be re-processed in the frozen state. OA

7 S 852
Preparing and cooking turkey breast fillets.
Smith, M. L.; Cunningham, F. E.
Poultry Science **50** (5) 1434-1437 (1971) [4 ref. En] [Dept. of Foods and Nutr., Kansas St. Univ., Manhattan, 66502, USA]

Breaded and frozen fillets prepared from breast muscle of young tom and young hen turkeys were cooked by 3 methods and evaluated by a trained taste-panel for flavour, texture, tenderness, juiciness and appearance. Kramer shear-press measurements were also made. Fillets cooked in a microwave oven were considerably more tender and juicier than those cooked in deep-fat or in a skillet. Deep-fat frying, however, produced the most desirable product in texture and appearance. The taste-panel found to difference in flavour that could be attributed to cooking method or to sex of the bird. Shear-press values were significantly lower for microwave cooked than for deep-fat or pan-fried fillets. These findings correlated well with those of the taste-panel. Method of cooking significantly influenced cooking losses. Deep-fat fried showed greatest cooking losses; microwave cooked fillets, the least. There was no difference in cooking loss between sexes. Fillets prepared from tom turkeys were more tender and juicier than those from hen turkeys. AS

8 E 336
Microwave heating of food and its effect on flavour. I & II.
Macleod, G.
Food Processing Industry **41** (485) 27-28; (486) 51-53 (1972) [32 ref. En]

The theory of microwave heating, related to microwave ovens and their use for cooking and reheating, is reviewed. Sensory and other tests used to compare microwave cooked food with that prepared by conventional methods are considered. VJG

8 H 1195
[Effects of heat treatment plus γ-irradiation and γ-irradiation in the cold on survival of Saccharomyces cerevisiae cells.]
Vlad, E.; Zarnescu, A.; Arizan, D.; Marseu. P.; Macedon, T.
Industria Alimentara **22** (5) 261-264 (1971) [9 ref. Ro, en, fr, de, ru] [Inst. de Cercetari si Proiectari Alimentare, Bucharest, Roumania]

White-grape juice from the Focsani vineyards containing initially 1.8×10^5 Saccharomyces cerevisiae var. ellipsoideus cells and white hybrid-grape juice from the Ilfor vineyards containing initally 1.2×10^6 cells were exposed to γ-radiation from a ^{60}Co source at 500-3000 krad at ambient (24°C) temp. (90 min at 400-2000 krad/h), or at 50-1000 krad at 50°C 630 min at 100-2000 krad/h), or at 200-3000 krad at -10°C (10 h at 100-300 krad/h). With each condition of irradiation and grape juice type, 10 juice samples of 60 ml were examined for yeast cell survival, storage life till beginning of fermentation and organoleptic properties. The results are graphically presented. It is concluded that irradiation at 50°C was from all viewpoints the most satisfactory procedure, enabling storage of juice for >180 days without loss of organoleptic quality with an input of only 200-300 krad vs. the 2000-2500 krad or 2500-3000 krad respectively required at 24°C or at -10°C to give the same length of storage life. Irradiation combined with heat treatment is also considered superior to heat treatment alone. SKK

8 M 899
Microwaves dry pasta.
Anon.
Food Engineering **44** (4) 94 & 96 (1972) [En]

The use of microwaves for drying pasta at both Golden Grain Macaroni Co. in California and Thomas J. Lipton in Canada, is described. The former retains the same look and cooking characteristics in their pasta; however Lipton permits a slight puffing of its soup noodles which halves home-cooking time. Benefits of microwave drying are as follows: microbiological counts and pest infestation are greatly reduced; microwave ovens are only $^{1}/_{10}$th the bulk of conventional ovens and have twice the production capacity; clean-up time is reduced from 16 to 1 h/wk - this frees 2 shifts for production each week at no extra cost; service and maintenance are reduced; changeover time from one product to another takes only a few min; and overall costs are reduced. AB

8 S 1032
Weaver speeds chicken processing with giant microwave system.
Anon.
Quick Frozen Foods **34** (7) 49 (1972) [En]

The world's largest microwave cooking system, manufactured by Varian Associates, California and in operation at the plant of Victor F. Weaver Inc., New Holland, Pennsylvania, is described. The conveyorized system, is powered by four 30-kW power packs, and cooks 3200 lb/h of chicken. Typical cooking time is reported to be 14-18 min for the largest pieces compared to 28-55 for conventional processes. Advantages of this method are: improved flavour of product, greater juice retention, and lower operating cost due to labour savings and improved yield. VJG

8 S 1049
Dieldrin residues and cooking losses in pork loins.
Maul, R. E.; Funk, K.; Zabik, M. E.; Zabik, M. J.
Journal of the American Dietetic Association **59** (5) 481-484 (1971) [20 ref. En] [Dept. of Food Sci. and Human Nutr., Michigan St. Univ., East Lansing, USA]

% of fat, ppm of dieldrin and % of cooking losses were determined for boneless pork loin chops cooked by braising, microwaves, and broiling and for boneless roasts cooked in a 177°C oven. No significant differences attributable to cooking method were evident in the % of fat and amount of dieldrin residues. In general, cooked samples showed lower levels of dieldrin residues than uncooked samples. Residues were present in cooking drip. Ranged in order of increasing % of total cooking losses were samples cooked by braising, microwave, roasting and broiling. AS

8 S 1074
Microwaves precook bacon.
Latronica, A. J.; Ziemba, J. V.
Food Engineering **44** (4) 62-64 (1972) [En]
[Instant Bacon Inc., Skokie, Illinois, USA]

The preparation of a new product called Insta-Bacon by Instant Bacon Inc., Skokie, Illinois, is outlined. Bacon slices are microwave cooked and packed in 20-slice drafts in shallow Al trays topped with cellophane. The product has been developed for use in hotels, restaurants, schools, hospitals and institutions, where individual trays can be rapidly prepared by heating in a grill or oven for 1-2 min. AB

9 E 358
[Defrosting food products by means of high-frequency currents.] [A review]
Ciobanu, A.
Industria Alimentara **21** (5) 250-254 (1970) [10 ref. Ro, en, fr, de, ru] [Inst. de Cercetari si Proiectari Alimentare, Bucharest, Roumania]

9 E 372
Second-generation reconstitution systems.
Livingston, G. E.; Chang, C. M.
Cornell Hotel and Restaurant Administration Quarterly **13** (1) 57-64 (1972) [5 ref. En] [Food Sci. Associates, Rye, New York 10580, USA]

Pre-heating of frozen or chilled prepared foods is discussed with reference to basic concepts of heat reconstitution, particularly; conduction, convection, and radiation heating methods; IR and microwave-ovens; hot H_2O immersion heaters; low pressure, high pressure, static type high pressure, and dynamic type high pressure steamers, and some combinations thereof. Manufacturers, methods, and equipment specifications are listed. Requirements for third-generation reconstitution equipment are outlined. OA

9 S 1199
Eating quality, sulfhydryl content, and TBA values of turkey breast muscle.
Bowers, J. A.
Journal of Agricultural and Food Chemistry **20** (3) 706-708 (1972) [17 ref. En] [Dept. of Foods & Nutr., Kansas Agric. Expt. Sta., Manhattan, 66502, USA]

Selected flavor and aroma components, juiciness, sulfhydryl groups, and TBA values were determined for freshly cooked and for precooked, frozen, reheated (in gas and in microwave ovens) turkey muscle. In general, freshly cooked muscle had the lowest rancid and stale and highest meaty-brothy flavor and aroma scores; microwave-reheated meat had intermediate scores; and conventionally reheated had the highest rancid and stale and lowest meaty-brothy flavor and aroma scores. Differences in TBA values and sulfhydryl groups were noted between cooked and raw muscle tissue, but not among muscle tissues subjected to the three heating treatments. AS

10 F 513
Carbonated beverage filling.
Elsner, N. A.; Nilson, H. E. (Infrarodteknik AB)
United States Patent 3 674 513 (1972) [En]
The headspace in bottles containing carbonated beverage is purged of air by exposing the surface of the beverage to IR or microwave energy to cause the decomposition of foam. IFT

10 G 487
The effects of thawing and heating methods on selected parameters of palatability, wholesomeness, and nutritive value of frozen prepared foods.
Harwood, V. E.
Dissertation Abstracts International. Section B. The Sciences and Engineering **32** (10) 5857-5858: Order no. 72-12 724 (1972) [En] [Univ. of Maryland, College Park, USA]
The effects of 5 heating systems (conventional range oven, compartment steamer, microwave oven, forced air convection oven and IR oven) on the quality of frozen beef stew, creamed spinach and chicken and noodle casserole were determined. Palatability was evaluated by a taste panel and by objective determination of colour and texture. Wholesomeness was evaluated by microbiological tests on samples heated to surface and centre temp. of 77°C. Protein quality was evaluated by microbial assay with Tetrahymena pyriformis. Results showed that no one system is best for heating all types of frozen food. Conventional equipment required the longest heating times; newer, faster equipment had detrimental side-effects (dehydration, scorching and burning). The taste panel preferred samples heated in the conventional oven; taste factors were more important than appearance. End-point internal temp. had the greatest effect on microbiological safety; protein quality was improved by heating, the original products being slightly undercooked. AJDW

10 G 495
Effects of microwaves on food and related materials.
Rosen, C.-G.
Food Technology **26** (7) 36-37, 39-40 & 55 (1972) [14 ref. En] [Dept. of Radiation Biol., Univ. of Stockholm, Sweden]
The author reviews the physico-chemical and molecular-biological background against which the effects caused by microwaves in biological materials should be interpreted. IFT

10 J 1669
Pickled onions.
United Kingdom, British Food Manufacturing Industries Research Association
British Patent 1 274 385 (1972) [En]
Onions are heated to 92°C by microwaves or by hot water immersion, after which they are preserved in pickling liquor. IFT

10 P 1522
[Determination of the dielectric characteristics of milk in an ultra-high frequency electromagnetic field.]
Shkabydova, R. A.
Molochnaya Promyshlennost' **33** (3) 14-17 (1972) [10 ref. Ru] [Vses. Nauchno-izsled. Inst. Molochnoi Promyshlennosti, USSR]
Values of dielectric constant and loss angle at 3000 MHz were calculated for milks of different composition over a range of temp. using Fricke's formula and the published data on water and aqueous solutions of Grant et al. [J. Chem. Phys. (1957) **27**: 156] and hasted et al. [J. Chem. Phys. (1948) **16**: 1]. Qualitative agreement with the author's experimental data [FSTA (1972) **4** 8P1251] was shown. JHP

10 P 1615
[Annual report of the Federal Teaching and Dairy Research Institute in Wolfpassing, 1971.]
Jahresbericht 1971 der Bundes-Lehr- und Versuchsanstalt für Milchwirtschaft in Wolfpassing.
Planckh, B. (Director)
Milchwirtschaftliche Berichte aus den Bundesanstalten Wolfpassing und Rotholz **1972** (31) 109-151 (1972) [De]
The report includes brief information on the research activities of the Institute, dealing in particular with the testing of dairy products (whipping cream and plain and fruit yoghurt); comparative tests of milk cans of 7 major manufacturers; determination of the correct rennet dosage and study of syneresis, using microbial rennet; manufacture of yoghurt, cheese and butter cultures from dried instant skim-milk; and use of microwave oven for DM determination in milk and milk products. Information on the Institute's dairy covers milk intake and utilization, milk quality and the results of grading of milk and milk products. Publications and lectures of the staff are listed. [See FSTA (1972) **4** 3P368 for 1970 report.] FL

10 R 575
[The effect of heat treatment on fish muscle phospholipid composition.]
El-Bastavizi, A. M.; Smirnova, G. A.
Voprosy Pitaniya **31** (3) 90-92 (1972) [6 ref. Ru, en] [Katedra Tekh. Proizvodstva Produktov Obshchestvennogo Pitaniiya, Moskovskii Inst. Narodnogo Khozyaistva imeni G.V. Plekhanova, Moscow, USSR]
20 kg samples of freshly caught (i) mirror carp and (ii) pike were cooked traditionally for 20 min or in a microwave oven for 3 min, lipids of fresh and cooked muscles were extracted by the method of Folch et al. [J. biol. Chem. (1957) **226**: 497-509] and the phospholipids were partitioned by TLC on silica gel. Contents of different fractions in fresh muscles of (i) and (ii) respectively were as % of total lipid: glycolipids, 0.18 and 0.35; plasmalogens + cardiolipids, 0.09 and 0.16; phosphatidic acids + glycerophosphatides, 1.26 and 2.90; phosphatidylethanolamine, 6.66 and 12.95;

phosphatidylinositol, traces and traces; phosphatidylcholine, 8.0 and 17.65; sphingomyelin, 1.08 and 2.0; lysophosphatidylcholine, 0.15 and 0.33; and phosphatidylserine, 0.12 and 0.30; the totals were 17.54 and 36.64. Cooking by either method did not cause substantial changes in qualitative or quantitative phospholipid composition. [See also FSTA (1970) **2** 7R270.] SKK

10 S 1389
Meat content analysis.
Davis, K. E. (Holart Manufacturing Co.)
United States Patent 3 673 852 (1972) [En]
Process for the rapid determination of fat in comminuted meat products uses microwave energy to separate the sample into fractions. IFT

10 S 1429
Bacon cooking.
Lane, A. B. (Hunt-Wesson Foods Inc.)
United States Patent 3 674 504 (1972) [En]
Cold or refrigerated bacon is preheated to a temp. of 150° Fby IR heating, after which it is cooked by exposure to microwave energy. IFT

11 E 427
[Dehydration of fluid or viscous substances by microwaves.]
Torcol, J.; Bricout, J.; Menoret, Y. (Institut de Recherches Appliquees aux Boissons; Bureau d'Etudes, Recherches & Exploitation de Brevets)
French Patent 2 080 271 (1971) [Fr]
A homogeneous, dry or very slightly hydrated product is obtained by subjecting liquid or viscous substances, e.g. coffee, tea and colorants, to a microwave field of ≥850 MHz and a vacuum. The substance can contain 40-80% DM and its viscosity may be modified by thickeners, e.g. carbohydrates, sucroglycerides, carrageenans, gum arabic, pectinates, methyl cellulose, carboxymethyl cellulose, or proteins. It may be foamed with an inert gas before drying. In an example, 20 g of concentrated, sweetened, whole milk containing 70% DM (9% fat) are spread in a 1-2 mm film and heated for 5 min from a 400 W source at 20 Torr. Heating is then discontinued and a vacuum of <1 Torr maintained for 5 min. The expanded and porous product is crushed. The very light product dissolves well in water at 15°C. W&Co

11 E 442
[Heating by micro- and macro-waves.]
Dutescu, F.; Novaceanu, M.
Industria Alimentara **23** (2) 95-99 (1972) [22 ref. Ro, en, fr, de, ru] [Inst. de Cercetari si Proiectari Alimentare, Bucharest, Roumania]
This review deals with application of micro- and macro-waves in the food industry to defrosting, freeze-drying, drying, dehydration, puff-drying, boiling, keeping quality improvement, and mould inhibition. SKK

11 J 1834
[Dehydration of vegetable extract.]
Bricout, J.; Menoret, Y.; Torcol, J. (**France**, Institut de Recherches Appliquees aux Boissons IRAB; **France**, Bureau d'Etudes Recherches et Exploitation de Brevets BEREB)
French Patent Application 2 077 976 (1971) [Fr]
A powder which is instantly soluble or micro-dispersible in water is obtained from a mixture comprising ≥10% by wt. of vegetable matter extract, e.g. the juice or pulp of strawberries, raspberries, blackcurrants, grapefruit, mandarin oranges or clementines, and ≤90% of a thickener comprising ≥1 glucide and, optionally, hydrophilic polymers. Alternatively, the extract may be an essential oil, e.g. essence of mint. This mixture is spread thinly on the bed of a microwave oven and subjected to a field ≥850 mHz and to a vacuum of ≤15 Torr. Examples relate to initial mixtures of 55-72% by wt. DM. W&Co

11 M 1198
Moisture determination.
Butcher, J.
Australasian Baker and Millers' Journal **75** (5) 35 & 37-38 (1972) [6 ref. En] [Bread Res. Inst., Private Bag, N. Ryde, NSW 2113, Australia]
After a discussion of the chemical constitution of water and its existence as bound or free water, ways of measuring moisture in wheat are considered. Methods covered include oven drying, measurements of electrical conductivity and capacitance, microwave absorption, NMR and IR absorption. Advantages and disadvantages of each method, and a brief description of one instrument of each type are given. PG

11 M 1269
Microwave cereal puffing.
McAlister, R. E.
United States Patent 3 682 651 (1972) [En]
A dispersion of cereal grains in a dipolar liquid such as water is exposed to microwave energy to vaporize the liquid and puff the cereal grains. IFT

11 M 1292
Fried bakery product.
Schiffmann, R. F.; Roth, H.; Lipka, D. H.; Goodman, A. H. (DCA Food Industries Inc.)
United States Patent 3 679 432 (1972) [En]
Partially cooked deep fried bakery products are subjected to microwave energy concurrent with frying. IFT

12 E 476
Microwave-convection heating of foods in aluminium containers.
Jimenez, M. A.
Food Technology **26** (9) 36 & 38-40 (1972) [8 ref. En] [Packaging Res. Div., Reynolds Metals Co., Richmond, Virginia 23219, USA]
Since metals reflect microwaves, foods placed in Al containers cannot normally be heated in

microwave ovens. This paper describes a study in which Al foil trays with window-plug lids were used to heat foods in a microwave convection oven, Micro-Aire Model U-1. Guidelines for heat conditioning frozen foods in institutional size Al containers and results obtained by heating various products in half-size Al steam table pans with window-plug lids using the Micro-Aire microwave convection oven are detailed for the following products: whole kernel corn; macaroni and cheese; potatoes maison; beef stew; stuffed peppers; veal parmesan; chicken cacciatore; honey-glazed carrots; and rice with peas and mushrooms. Results indicate that half-size Al foil steam table trays with window-plug lids can be satisfactorily used for heating foods in microwave ovens. AA

12 H 1804
Fruit juice concentrates and powders: I. Development of a new concentration procedure. II. Physicochemical and volatile flavour changes.
Bolin, H. R.
Dissertation Abstracts International. Section B. The Sciences and Engineering **32** (7) 3996: Order no. 72-4703 (1972) [En] [Utah St. Univ., Logan, USA]

A diffusion-membrane procedure for the concn. of fruit juices is described. Evaluation of the effect various concn. methods had on volatile losses during the concn. of apple, sour cherry and peach juices showed that: freeze concn. resulted in the least loss; diffusion-membrane concn. resulted in a slightly greater overall loss of volatiles but less than osmosis, which was slow and resulted in a noticeable flavour change in both apple and cherry concentrates; and concn. by reverse osmosis was fairly fast and there was no detectable flavour change, but a large % of volatiles were lost. Microwave radiation seemed to accelerate water transfer through the membrane during osmotic concn. Juice powders lost a large amount of volatiles and the changes that occurred during drying could be detected in all juices by sensory evaluation. AA

12 S 1614
Centralized processing of frozen precooked chicken.
Sison, E. C.
Dissertation Abstracts International. Section B. The Sciences and Engineering **32** (12) 7101-7102: Order no. 72-16 515 (1972) [En] [Michigan St. Univ., East Lansing, 48823, USA]

A study was made of centralized processing of frozen precooked chicken. Cut-up chickenpieces were coated with breadings or batters; cooked by pressure frying or by microwave-steam pre-cooking in combination with pressure frying or deep-fat frying; frozen by air blast, liquid N_2, or liquid freon; packaged in polyethylene bags, laminated pouches, or Al foil trays with or without acetylated monoglyceride coating; stored at constant -18°C or under simulated distribution condition; and then reheated in a microwave oven and evaluated by taste panels. It was generally observed that chicken pieces vary widely in sizes and shapes, and thus require different processing times. Thus, it is recommended that size and cutting procedure should be made more uniform and that different pieces should be processed separately. It is concluded that a commercial process consisting of soaking raw, cut-up chicken pieces overnight in polyphosphate solution; precooking by microwave and steam; coating with breading; browning by deep-fat-frying; freezing with any economical but reasonably fast method; and packaging in any commercially practical package with good protective properties, is suitable for the centralized preparation of frozen precooked chicken. AA

12 S 1697
Thiamine and riboflavine in cooked and frozen reheated turkey.
Bowers, J. A.; Fryer, B. A.
Journal of the American Dietetic Association **60** (5) 399-401 (1972) [13 ref. En] [Dept. of Foods & Nutr., Kansas St. Univ., Manhattan, USA]

Thiamine, riboflavine, moisture and fat were determined for samples from 12 paired turkey pectoralis major muscles. Microwave or gas ovens were used in the treatments, in which muscles were: cooked; cooked, reheated after one day of refrigerated storage; cooked, frozen; or cooked, frozen, reheated. Type of oven had no significant effect on thiamine content. Muscle held 1 day at refrigerator temp. nad reheated was higher in thiamine than was muscle subjected to the other treatments (both wet and moisture-free, fat-free basis). Muscle heated by gas had more riboflavine than did muscle heated by microwave (moisture free, fat-free basis); differences were not significant for values calculated on the wet basis or as percentage retention. All factors, except moisture, were affected significantly by bird. Variation was greater among birds than between ovens or among treatments. AS

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J. NEWTON
ASSISTANT EDITOR

1 A 40
Dielectric property measurements of liquid food systems at microwave frequencies.
Weil, K. O.
Dissertation Abstracts International, B **32** (12) 7102: Order no. 72-16 534 (1972) [En] [Michigan St. Univ., East Lansing, 48823, USA]

1 J 165
Lipoxidase inactivation in the whole soybean and its effects on extracted oil meal quality.
Rice, R. D.
1143bc **33** (1) 259: Order no. 72-19 913 (1972) [En] [Univ. of Illinois, Urbana, USA]

Thermal inactivation of lipoxidase (i) in whole soybeans was investigated; microwave heating eas much slower than steam-heating at 210°F. (i) inactivation followed first-order kinetics, and depended on moisture content. Inactivation time increased linearly as moisture content fell from 60 to 20%; as the moisture content fell below 20%, the (i) inactivation time increased exponentially. Organoleptic testing showed the presence of active (i) in soybeans heated for 6-8 min; calculations suggested that (i) activity can be organoleptically detected at $<1 \times 10^{-9}$ of the level present in raw beans. Oil prepared from beans heated for 10 min at 210°F had a Swift Stability Test value of 62 h at 210°F; the corresponding value for oil from raw beans was 56 h. Organoleptic evaluation of oils aerated at 210°F showed that oils from heated and raw beans were noticeably rancid after 57 and 43 h respectively. The flavour of flakes prepared from blanched beans was preferred to that of flakes prepared from raw beans. AJDW

1 S 4
[Losses on heating meat from healthy and unhealthy animals.] Erhitzungsverluste des Fleisches von normal- und krankgeschlachteten Tieren.
Scharner, E.; Elter, B.; Stecher, G.
Fleisch **24** (11) 297-299 (1970) [10 ref. De] [Sektion Tierproduktion & Veterinärmedizin, Karl-Marx-Univ., Leipzig, Fachgruppe Lebensmittelhygiene, German Democratic Republic]

The major changes in heated meat, compared with fresh, are in structure, colour and consistency, leading to a drop in quality. With regard to the proteins, the gratest changes are in the muscle proteins. These physico-chemical changes involve coagulation of the proteins, the colour and consistency and the water retention. The 3 major heating methods are boiling, grilling and use of microwaves. Losses on boiling of beef from healthy cows were significantly lower than those from unhealthy cows. Boiling gave the greatest reproducibility of results. IN

1 S 80
[Process for the commercial manufacture of a preserve or partial preserve of crusted pate based on foies gras and the like.]
Parachini, G.
French Patent 2 087 338 (1971) [Fr]

Cooked and seasoned foies gras are completely enclosed in an envelope of brioche pate which has been treated with ascorbic acid. The whole is precooked in an oven with periodic air recycling for 10 min, without the livers' even being heated, and then cooked for 2 min in a microwave oven, which cooks the livers throughout and completes cooking of the crust (without melting the fats, causing evaporation, or changing the flavour or texture of the livers). W&Co

2 A 94
[Changes in nutritional value of foods during microwave heating. A review.]
Sweden, Svenska Institutet för Konserveringsforskning
SIK Rapport No. 273, 15pp. (1970) [18 ref. Sv]

2 B 17
[The non-thermal effect of microwaves on microorganisms.] Zur Frage des nichtthermischen Effektes von Mikrowellen auf Mikroorganismen.
Bomar, M. T.; Grünewald, T.
Lebensmittel-Wissenschaft + Technologie **5** (5) 166-171 (1972) [27 ref. De, en] [Inst. für Physik und Biol., Bundesforschungsanstalt für Lebensmittelfrischhaltung, 75-Karlsruhe, Federal Republic of Germany]

It was the aim of this investigation to study the possible non-thermal antimicrobial effect of high-frequency waves. Bacillus subtilis var. niger ATCC 9372 and B. stearothermophilus were used as test microorganisms. The activity of the microwaves was tested in nutrient broth and in olive oil. During the experiments the thermal effect was eliminated; the nutrient broth was cooled in order to maintain a specific temp. during microwave treatment. In this way it was possible to compare the antimicrobial effect of microwaves with that of conventional heating. The experiments with olive oil were carried out in order to eliminate the possible effect of water on the antimicrobial activity of microwaves. In some experiments cell sensitivity to microwave treatment was tested during the log phase. A non-thermal effect was not observed under any of these conditions. AS

2 E 57
Thawing process.
Loubert, D. W.; Meyer, J. A. (Pillsbury Co.)
United States Patent 3 694 608 (1972) [En]

Food products are thawed by a series of intermittent microwave energy pulses to reduce moisture loss during heating. IFT

2 E 58
[Pasteurization of foods: a seminarium held on 10-11th March, 1971.]
Sweden, Svenska Institutet för Konserveringsforskning
SIK Rapport No. 292, 184pp. (1971) [Sv & En]

Papers given at the seminarium included: The microbiology of food pasteurization, by M. Ingram (pp. A1-A44, 57 ref.); Limitations of and factors affecting the botulinum cook, by P. J. Anema (pp. 1-16, 21 ref.); [Salt, nitrite and nitrate in combination with heat treatment of foods], by P. Zeuthen (pp. 17-33, 8 ref.); Nisin in combination with heat treatment of foods, by G. G. Fowler (pp. 34-41, 4 ref.); [Development trends in heat conservation in the light of research into spores at SIK], by B. G. Snygg (pp. 42-56); [The equipment manufacturer's viewpoint on problems of pasteurization], by S. Holm (pp. 57-77); [Dielectric pasteurization], by N. Bengtsson (pp. 78-93); [Irradiation pasteurization], by G. Härnulv (pp. 94-110, 28 ref.); [Choice of pack with pasteurization], by C. Sjöström (pp. 111-134); [Pasteurization of malt beverages and soft drinks], by B. Jacobsson (pp. 135-146); [Pasteurization of juice, fruit preserves and jam], by K.-J. Lindqvist (pp. 147-152); [Heat stabilization of foods in plastics packs], by O. Kvale (pp. 153-175); and [Pasteurization of meat products], by B. Eriksson (pp. 176-184). HBr

2 J 271
Microwave processing of citrus salad gels in plastic containers.
Rouse, A. H.; Moore, E. L.
Proceedings of the Florida State Horticultural Society **84**, 241-244 (1971) [10 ref. En] [IFAS Agric. Res. & Education Center, Lake Alfred, Florida, USA]

Chopped orange and grapefruit sections with and without gel were heated with microwave energy for varying lengths of time in rigid, clear, 4.5 fl oz plastic containers. The effectiveness of the dielectric heating was measured by the percentage of pectinesterase inactivated in the product. The degree of pasteurization was limited by time and temp. that the plastic could withstand without discolouration and distortion The greatest reduction of enzymic activity in the product, without causing severe damage to the plastic containers, was obtained by a combination of exposing the sections for 2 min to microwaves, plus the addition of hot gel at 180°F, followed by intermittent microwave treatment for 5 min. This reduced the pectinesterase by a range of 78.8 to 90.4% depending on the position of the samples in the oven. AS

2 M 128
Inactivation of α-amylase in wheat flour with microwaves.
Aref, M. M.; Noel, L.-G.; Miller, H.
Journal of Microwave Power **7** (3) 215-221 (1972) [14 ref. En, fr] [Res. Branch, Dept. of Agric., Ottawa, Ontario, Canada]

High α-amylase flour was exposed to microwave energy in a 1.8 kW 2450 MHz oven for periods ranging from 30 to 100 sec. The flour was packed in a tray (5 × 7 × 1.5 in) made of 0.5 Tentest (pressed plain wood fibreboard) and holding 500 g of flour. 60-sec exposure of flour to microwave energy reduced the enzyme activity to an acceptable level with no deleterious effects on the principal characteristics of flour related to dough formation. This exposure drastically reduced the number of viable organisms in the flour, but appeared to cause a fairly high loss in moisture; the latter may possibly be eliminated by minor changes in exposure, or by modification of equipment. OA

2 M 147
Frequency dependence of the dielectric properties of wheat and the rice weevil.
Nelson, S. O.
1143bc **33** (1) 163: Order no. 72-19 997 (1972) [En] [Iowa St. Univ., Ames, USA]

The dielectric properties of bulk samples of hard red winter wheat and of adult rice weevils were investigated at 22 frequencies in the range 250 Hz-12.2 GHz; the results were corrected for density variations. Dielectric constants of both wheat and weevils decreased with increasing frequency, exhibiting a dispersion at frequencies >100 kHz. The accompanying absorption peaked in the range 5-100 MHz, weevils having a much higher absorption peak than grain. Insect: grain power absorption ratios were calculated, and revealed the frequency range 5-100 MHz to be the most promising for insect control by selective heating. AJDW

2 M 161
Rice drying and storage studies.
Calderwood, D. L.
Rice Journal **75** (7) 63 (1972) [En] [USDA, Texas Agric. Expt. Sta., Beaumont, USA]

Continuous-flow heated air dryer was tested at rice flow rate of 13-25 min/pass at constant heated air vol. Temp. was varied so that rice temp. following dryer pass was approx. 110°F. Amount of drying/pass and milling quality of dried rice were about the same for all flow rates. In a fluid-bed dryer, rough rice was dried from 17.4 to 12.6% moisture (wet basis) in a single pass at air temp. of 150°F and rice flow of 1.85 lb/min. Rice emerged at 120°F. At 240°F and rice flow of 51 lb/min, moisture was reduced from 17.2 to 15.1%, rice emerging at 121°F. An additional pass was needed to dry to <13% moisture, making an effective flow rate of 25 lb/min. Milling yield was the same as for air-dried controls. Laboratory scale tests on microwave drying showed that amount of drying was a function of rice temp. and time required to cool rice to ambient temp. Heating to high temp reduced milling quality. Adding propionic acid based mould inhibitor at 4 lb/ton of rice did not improve storage of rice at 18 and 2[illegible] moisture

levels. At 40 lb/ton it inhibited moulding of rice at 22% moisture during 90 days' storage, but led to downgrading because of the sour odour imparted by the acid. RM

2 M 179
Microwave drying cuts costs.
Anon.
Food Engineering **44** (11) 78-79 (1972) [En]
Microwave drying of pasta products at D'Amico Macaroni Co., Chicago, is described. Operations are as follows: Preliminary drying in a conventional dryer raises product temp. to 100°F in 35 min. Then pasta temp. rises to 180°F during the 6 min in the microwave dryer, where sterilization also takes place. From there the product drops into the cooling or equalizing chamber in the bottom of the microwave dryer. If the air here is too dry, checking can occur, so a humistat controls injection of steam when humidity falls too low. D'Amico uses microwave drying on egg noodles, ranging in size from small soup noodles to large packaging varieties. Bacterial count is almost zero and the microwave-dried products lose none of their original quality. AA

2 S 222
Tempers meat in conveyorized tunnel.
Anon.
Food Engineering **44** (11) 200, 202 (1972) [En]
A description is given of the Radarline Meat Tempering Tunnel, made by Raytheon Co., Waltham, Massachusetts. The 36 ft long tunnel is a conveyorized microwave oven designed to temper frozen meat, poultry or seafood. Boxed meat direct from the freezer can be taken into the unit and raised from 0 to 27°F in <10 min. The finished temp. can be precisely controlled by adjusting belt speed and microwave power. This facilitates grinding, slicing, dicing, forming or other processing operations. Production rates vary depending upon initial product temp., and fat, bone and moisture content of the meat. AA

2 T 92
Enzyme inactivation - the effect of heat and ionising radiations on peroxidase isoenzymes.
Enzymaktivierung - das Verhalten von Isoenzymen der Peroxidase bei Einwirkung von Hitze und ionisierenden Strahlen.
Diehl, J. F.
Dechema-Monographien **70**, 265-277 (1972) [26 ref. De, en, fr] [Bundesforschungsanstalt für Lebensmittelfrischhaltung, Karlsruhe, Federal Republic of Germany]
The effects of heat and γ-irradiation on the isoenzyme pattern of horseradish peroxidase were studied by thin layer gel filtration (TLG) and thin layer isoelectric focussing (TLIF), separating isoenzymes by mol. wt. and isoelectric point (pI). Of approx. 20 isoenzymes with pI 3.7-8.4, those with pI >7.5 were most susceptible to heat, forming almost totally inactive aggregates of mol. wt. >200 000 (40 000 before heating). With γ irradiation, aggregation proceeded by way of dimers, trimers etc. possessing considerable activity. After irradiation with 2 Mrad, active monomers were restricted to pI 4.0-7.1, active aggregates to pI 4.0-6.5. In contrast to findings by Balsen and Goldblith [J. Food Sci. (1961) **26**, 91] irradiation followed by heating acted synergistically, possibly through increased heat sensitivity of radiation-induced enzymically active dimers and higher aggregates. Microwave heating produced the same inactivation patterns as heating to 90°C, but aggregates could be shown by TLG as aggregates separated out. The methods were also applied to peroxidases from other sources and to other enzymes. RM

3 E 87
Radio frequency heating applications in the European food industry.
Bengtsson, N. E.
SIK Rapport No. 259, 8pp. (1969) [7 ref. En]
Applications of radio frequency heating in Europe are briefly discussed under the headings; baking; bread pasteurization; defrosting; drying; sterilization; pasteurization; disinfestation; other developments; and general outlook. HBr

3 E 88
[Dielectrical and other physical properties of foods - their significance for the heating process.]
Bengtsson, N. E.
SIK Rapport No. 290, 19pp. (1971) [34 ref. Sv]
This material is designed for use in courses on microwave techniques. It covers dieletrical properties; depth of penetration and development of effects at various frequencies; and general physical properties of foods. HBr

3 E 89
Differential temperature container/package key to frozen foods/meals applications.
Anon.
Food Processing **33** (10) F10-F11 (1972) [En]
The differential heating container (DHC) recently developed uses a patented metal shielding which makes it possible to rapidly heat a complete meal in a microwave oven with each component having a different temp. at the end of the heating cycle (2-4 min). A typical meal would consist of an entree at 160°F, vegetable and potato at 150°F, roll at 100°F and dessert at 40°F. Trays for the meal must be of polystyrene, paper or other non-metallic material, and are placed in the metal container which has apertures of different size and configuration above and below each item that is to be heated. The method can also be used for prepared meals for the home. PG

3 R 179
[Effect of heat treatment on composition of muscle proteins in fish.]
Aman, M. E. B.; Smirnova, G. A.
Rybnoe Khozyaistvo **No. 6**, 71-75 (1972) [Ru] [Moskovskii Inst., Narodnogo Khozyaistva im. G.V. Plekhanova, USSR]

Different methods of heat treatment were studied (boiling in a small amount of water for 20 min, high-frequency current treatment for 3 min, and frying in thin layer of sunflower oil) as regards their effect on protein composition. Myofibrillar, sarcoplasmatic proteins, stroma, denatured proteins and non-protein nitrogenous materials were studied in carp and pike, prior to and after thermal treatment. Least stable are myofibrillar proteins the solubility of which was strongly reduced following thermal treatment; boiling in steam and thermal treatment in a high-frequency field produced an identical effect on muscle proteins. STI

3 S 328
[Meat products and their manufacture.]
Unilever NV
Netherlands Patent Application 7 204 636 (1972) [Nl]

Reconstituted meat products are obtained by extruding comminuted meat through a preferably 3-7 mm wide, flat slot at uniform pressure, the extrudate being heat treated between, and in close contact with, layers of a heat-resistant absorbent material (preferably absorbent paper). These paper layers, which are removed after heating, have a grained surface which imparts an embossed appearance to the product. Heat-treatment is preferably by exposure to hot oven gases (>5 min for single layers of extrudate or ≤30 min for 10 stacked layers). Microwave treatment requires less time (≤1min) but produces a less pronounced grain. The process is particularly suitable for meat of lower quality, e.g. containing a lot of connective tissue. The meat may be comminuted in a colloidal mill, hammer mill or bowl chopper. The extrusion mixture may contain cooked meat fibres or comminuted spun protein fibres in an amount of 5-20%. W&Co

4 E 135
The ABC's of microwave cooking.
Anon.
Journal of Microwave Power 7 (4) 397-409 (1972) [6 ref. En]

This popular article describes the subject under the headings: What is microwave energy?; How does microwave energy produce heat?; How does microwave energy cook so fast?; Microwave properties; Microwave power: its measurement and its meaning; The microwave oven; Microwave safety; Browning; Size grading; Food geometry; Shielding; Microbiology and microwaves; Containers and packaging materials; and Effect of microwave energy on the nutritive value of foods. JN

4 E 153
[High-performance conveying unit used for sterilization of fluid media.]
Boim, B. M.; Golger, L. I.
Trudy, Vsesoyuznyi Nauchno-issledovatel'skii Institut Konservnoi i Ovoshchesushil'noi Promyshlennosti 14, 100-103 (1971) [Ru]

A high-frequency unit, processing 100 kg/h, is described for sterilizing nutrient media in the production of enzyme preparations. The sterilizer consists of the sterilizing chamber itself, incorporating a condenser; the conveyor belt moves through the high-frequency field of the condenser and the chamber also incorporates a worm-type mixing unit and the dosers for the inoculation suspensions. The high-frequency power source is a 10 kW industrial generator. STI

4 J 493
[Effect of water-soluble substances on the regimes of vegetable processing in high-frequency electromagnetic field.]
Aleshina, L. M.; Kirpichnikov, V. P.
Izvestiya Vysshikh Uchebnykh Zavedenii, Pishchevaya Tekhnologiya No. 2, 82-84 (1972) [11 ref. Ru] [Moskovskii Inst. Narodnogo Khozyaistva im. G.V. Plekhanova, USSR]

The period for thermal processing of vegetables in a high-frequency electromagnetic field (2400 MHz) does not depend solely on the dielectric properties of the vegetables, but also on the content and composition of water-soluble substances. A lower content of such substances is responsible for extending the boiling period. Softening of vegetables is favourably affected by substances which cause the breakdown of protopectin, especially sodium oxalate which is a source of monovalent cations, and which causes the precipitation of Ca. The results presented were obtained from tests on potatoes, carrots and beets. STI

4 L 331
[Heat treatment: observations on heating of honey.]
Thermische Stoffbehandlung: Betrachtungen zur Honigerwärmung.
Bergel, C.; Stuwe, G. G.
Süsswaren 16 (3) 77-78, 80-82, 84 (1972) [12 ref. De] [Edeka-Zentrale eGmbH, Hamburg, Federal Republic of Germany]

The effects of heating (to reduce viscosity and delay crystallization) on the quality of honey are discussed, with reference to: composition of honey; legislation; heat sensitivity of honey; changes in the diastase activity, saccharase activity and hydroxymethylfurfural content; and effects on nutritional value. Conventional and dielectric heating methods are compared, with reference to experimental data on heating rate, uniformity of heating, and quality of the end product; dielectric heating caused negligible changes in the diastase activity and the hydroxymethylfurfural content of honey. Recommendations are given for dielectric heating of honey packaged in glass jars. AJDW

4 M 356
[Effect of high frequency current on wheat flour quality.]
Sowa, T.; Chabiera, J.
Przemysl Spozywczy **26** (11) 496-499 (1972) [16 ref. Pl, ru, en, fr, de] [Zaklad Badawczy Przemyslu Piekarniczego, Poland]

Samples of type 800 wheat flour taken immediately after milling (moisture, 13.4-17.17%; acidity, 3.5-4.1°; gluten content, 30.6-32.4%) were heated in Steelon (polyamide) bags between the plates of a high frequency generator (27 MHz; 220 V, 50 Hz; 1 kW input, 3 kV output) at 800 V for 9 time intervals in the range 0.5-5 min (temp. range, 20-65.5°C), and gluten elasticity and flow properties were measured directly and after storage for 2-8 wk. Heating for 2-3 min increased, and heating for 4-5 min reduced the 2 gluten characteristics. In general, the changes persisted during storage. The treatment had no effect on flour acidity. SKK

4 S 510
Bone darkening in frozen chicken broilers and ducklings.
Hatch, V.; Stadelman, W. J.
Journal of Food Science **37** (6) 850-852 (1972) [13 ref. En] [Dept. of Animal Sci., Purdue Univ., Lafayette, Indiana 47907, USA]

Frozen broilers are characterized by an undesirable darkening of the bones. The effect of the following treatments upon darkening was determined: freezing rates, thawing rates, cooking method, refrigerated ageing time, % bone ash, calcium and phosphorus in the femurs, dietary calcium level, and microwave preheating of broilers and ducklings. The freezing rate did not affect darkening. Cooking directly from the frozen condition gave less darkening than rapid or slow thawing. Ageing prior to freezing for over 5 days gave increased darkening. Birds cooked rapidly with microwaves exhibited less darkening than those deep-fat fried. Increased dietary calcium decreased darkening, but not through increased bone calcification. The percentage bone ash of broiler femurs was singificantly less than duckling femurs, but the percentage of calcium of phosphorus was not different between the species. No darkening occurs in ducklings. No significant correlation between bone ash or percentage calcium vs. darkening could be shown. IFT

5 E 166
Microwave adapter permits frozen foods in foil containers to heat in minutes.
Martin, S.
Quick Frozen Foods **34** (10) 44-45, 100-101 (1972) [En]

A serious limitation on the use of frozen foods with a microwave oven has been its inability to accept metal containers. The new innovation is to replace conventional ovens with microwave units, not merely to supplement them. Basic changes made in the structure of the Raytheon Radar Range unit are as follows: special insulation to protect the tube from melting if there is excess heat due to arcing or flash-back; variable power control enabling the wattage to be controlled from 0 to the machines capacity thus making baking, broiling, grilling, boiling and barbecue activities possible; venting for the unit, to carry off smoke after frying or barbecue activities. This kiln has ferrite wireless elements moulded into its bottom and top inside surfaces. Through a process of controlled arcing the microwaves generate heat in the ferrite and without any electrical current, this heat is transferred to the bottom of the foil tray, eliminating the hot and cold spots in the cooking or heating of products in a metal container within the cavity of a microwave unit. This adaptor has the advantage of speed of via microwave combined with the browning and crusting effect of the IR rays emitted by the element. It can be used to reheat or cook frozen products from the raw state. VJG

5 G 268
Convenience and fast food handbook. [Book]
Thorner, M. E.
vii+358pp. ISBN 0 87055 134 5 (1973) [many ref. En] Westport, Connecticut, USA, AVI Publishing Co. Inc. Price $20.00 (US) $21.00 (Foreign) [Culinary Inst. of America, Hyde Park, New York, USA]

This book, which is intended to be a primer, on the use of equipment and its effects on foods, handling and preservation, is divided into 2 sections: The fast food preparation centre (pp. 15-148) and Control, evaluation and handling of efficiency foods (pp. 149-345). The following chapters are included: History and concepts (pp. 1-13, 12 ref.); Preparation systems (pp. 14-28, 9 ref.); Storage areas (pp. 29-56, 15 ref.); The production area (pp. 57-101, 20 ref.); Microwave cookery (pp. 102-132, 8 ref.); Deep frying (pp. 133-148, 9 ref.); Quality control (pp. 149-218, 26 ref.); Concepts of efficiency foods (pp. 219-261, 37 ref.); Convenience foods (pp. 262-329, 32 ref.); and Convenience desserts and beverages (pp. 330-345, 14 ref.). VJG

5 J 653
The progess of microwave blanching.
Decareau, R. V.
Food Production/Management **95** (5) 12, 14 (1972) [12 ref. En]

The development, problems and prospects of blanching fruit and vegetables using microwaves, microwave/steam combinations, and IR irradiation are discussed. JN

6 E 188
[6th International Congress on Canning.]
Anon.
Industrie Alimentari **12** (1) 100-117 (1973) [It]

Resumes are given of papers read at the Congress, held in Paris in Nov. 1972, and include: Canned foods from the medical viewpoint, by G. de Pontanel; The current situation and prospects for the canned food industry throughout the world, by E. A. Asselbergs; The activities of WHO, by F. C. Lu; The activities of the FDA, by L. M. Beacham;

International and national legislation, by T. Obara; The Codex Alimentarius and national legislation, by C. Castang; Development of the food package, by E. F. Eike; Internal corrosion in metal containers, by T. Horio; External corrosion of metal containers, by C. H. Manheim; Optimal dimensions for a production unit, by M. M. J. Smedley; Reduction of water consumption as a means of reducing pollution, by A. Morgan & W. Mercer; Treatment of canning waste in Australia, by J. F. Kefford; Canning effluent, by A. F. Bonino; Water as a source of spores in fruit canning, by G. G. Knock, R. C. Hunter & C. A. Knock; Water quality in the food industry, by K. Kojima; Effects of storage on fruit and vegetable quality, by L. Gersons; Pretreatment of fruit in a controlled atm., by R. Ulrich & P. Marcellin; Cold storage and ripening of pears, by J. F. Kefford; Radio-energy and its applications, by S. A. Goldblith; Blanching of peas in water and by use of microwaves, by P. Varouquaux & C. Avisse; Precooling of peaches, by J. Philippon & R. Ulrich; Pretreatment of shrimps, by P. Hansen; and Thawing of fish, by J. R. Crepey & J. Maillard. HBr

6 E 200
[Process for sterilization of an aqueous liquid packaged in plastics.]
DORLYL Sarl
French Patent 2 127 406 (1972) [Fr]

A liquid food, e.g. fruit juice, and the inner surface of its PVC pack (particularly a PVC bottle) are sterilized simultaneously by application of a 2450 MHz(±50 MHz) electromagnetic field. If the liquid is required to exceed the softening point of the PVC (60°C), a cooling gas is passed over the outer surface of the pack during its passage through the sterilization tunnel and afterwards until the liquid has cooled sufficiently. The pack may be held in a mould during this process. W&Co

6 M 694
[Is high-frequency baking yet a going proposition?]
Ist das Backen mit Hochfrequenz noch aktuell?
Kriems, P.; Möller, B.
Bäcker und Konditor **20** (11) 330-333 (1972) [12 ref. De] [Inst. für Getreideverarbeitung, Bergholz-Rehbrücke, German Democratic Republic]

The product to be baked by the high frequency technique represents a dielectric in an electrical alternating field; a description is given of the electrophysical principles of this method (which reduces baking time). Since the method does not produce a crust, one must be made afterwards. An imitation crust can be made by spraying on a dye coating; additional baking in conventional or IR ovens will also produce a crust. It is emphasized that the potential for large-scale application of high and ultra-high frequencies is still very limited at present as far as baking is concerned, but that developments (particularly in the economics of the process and in irradiation protection) make future large-scale application quite feasible. IN

7 E 242
[Applications of microwave heating in the food industry.] Mikrowellenwärme: Anwendungsbeispiele in der Ernährungsindustrie.
Püschner, H. A.
Ernährungswirtschaft No. 1, 16, 18-20, 23 (1973) [4 ref. De] [Püschner GmbH & Co. KG, Schwanewede, Federal Republic of Germany]

The characteristics and operation of microwave-heating systems are discussed. Applications described include coagulation of protein products, cooking of meat, proofing of yeast-raised bakery products, drying of foods, and final drying of pommes frites. IN

7 E 250
[Expansion drying.]
Suchy, J.; Balcar, V.; Kopriva, M.
Prumysl Potravin **24** (3) Suppl. Potravinarska a chladici Technika **2** (4) 49-52 (1973) [6 ref. Cs, ru, fr, en] [CAZ, Vyzkumny Ustav Potravinarskeho Prumyslu, Prague, Czechoslovakia]

This illustrated article describes laboratory-scale experiments carried out in the authors' institute on expansion drying of carrots, potatoes, celery and apples using indirect heating, steam heating, or microwave heating with a rectangular resonator chamber at atmospheric pressure or a cylindrical resonator chamber at reduced pressure. SKK

7 G 337
Abstracts of papers presented at the 61 st Annual Meeting of the Poultry Science Association, Inc.
USA, Poultry Science Association
Poultry Science **51** (5) 1778-1889 (1972) [En]

Effect of Ca source, $NaHCO_3$ and temp. on egg shell quality, by O. W. Charles, R. Clark, T. M. Huston & J. V. Shutze (p. 1793); Studies on "hot" packaging of whole chicken, by T. C. Chen (pp. 1793-1794); Effect of diet and curing procedures on quality, of smoked turkeys, by D. D. Cohn & K. K. Hale, Jr. (p. 1795); Hot-pack pasteurization of salted egg products, by O. J. Cotterill, J. Glauert & S. E. Steinhoff (p. 1796); Fatty acid distribution in egg yolk triglycerides from various avian species, by J. R. Couch & A. E. Saloma (pp. 1796-1797); Effect of diet on composition of egg yolk triglycerides by J. R. Couch & A. E. Saloma (p. 1797); Wholesale-retail price relationship for grade A large and medium eggs, by J. L. Dale, C. C. Sheppard, C. J. Flegal & J. H. Wolford (p. 1798); Stability of microwave pre-cooked chicken during frozen storage, by L. E. Dawson, M. Gomez & E. Payne (p. 1799); Some factors affecting the quantity of abdominal fat in commercial broilers, by J. W. Deaton, L. F. Kubena, T. C. Chen, F. N. Reece, B. D. Lott & J. D. May (p. 1800); An educational programme for reducing possible Salmonella contamination in processed poultry, by C. M. Fischer, E. M. Dickinson & F. Watts (p. 1807);

JA

7 G 359
[Swelling and drying of soybean protein by microwave heating.] [Review]
Tsuyuki, H.; Suto, J.
Up-to-Date Food Processing [Shokuhin Kaihatsu] **7** (11) 32-41; (12) 35-41 (1972) [25 ref. Ja] [Nihon Univ., Setagaya, Tokyo, Japan]

Soybean protein isolate was dried by microwave heating and the dried swollen product was processed to simulate meat or fried tofu. The processing data are tabulated. SKa

7 M 904
Investigations into the possibilities of application of high frequency electric fields to the baking of dough.
Runtag, T.; Demeczky, M.
Acta Alimentaria Academiae Scientiarum Hungaricae **2** (1) 3-16 (1973) [32 ref. En] [Central Food Res. Inst., 1525 Budapest, II, Herman Otto ut 15, Hungary]

Applicability of high frequency (HF) electric fields to bread baking was investigated. Work was centred on determination of dielectric constant (ε) and loss angle (δ). Dependence of ε and δ on temp. was determined for dough having the same composition as that for fine white bread in a HF field simulating work conditions. It was established that the loss factor which characterizes energy uptake in dielectric HF field i.e. product of ε and of tangent of δ, rises up to about 75°C and then decreases till the end baking. Dough temp. rises rapidly in first stage of baking, and drops significantly after vigorous evaporation has set in. Final temp. is ≤96-98°C. If baking is performed in dielectric HF field under conditions which correspond to a baking period of 4-4.5 min, energy must not be transmitted to the material before weight loss has reached ¾ of desired total weight loss, or the material will lose more water than is desirable and will be dry. Bread baked in dielectric field has a looser crumb structure, vol. is 25-30% greater than that of bread baked by traditional methods, while it maintains the same organoleptic properties. Reproducibility of experiments and the small deviation of results permit the conclusion that values obtained are suitable for satisfactory estimation of prospective plant conditions. AS

8 E 263
A cavity perturbation method for routine permittivity measurement.
Rzepecka, M. A.
Journal of Microwave Power **8** (1) 3-11 (1973) [En] [Dept. of Food Sci., Univ. of Manitoba, Winnipeg, Canada]

A novel method of permittivity measurement by a cavity perturbation technique at microwave frequencies is suggested. The method employs a frequency counter for determination of a cavity Q factor. The principle of operation, uncertainty analysis and measurement set up are described. The structure of the resonator and sample holder permit continuous control and monitoring of sample temp. The method was verified experimentally by measuring a few substances of known permittivity. Dielectric properties of several foods (conc. whey, cream cheese, egg yolk, egg white, partially dried onion, parsley and red peppers) measured by this technique are reported. Results showed that the accuracy of the method is comparable to that of the most accurate methods using frequency markers. The measurement procedure is simple, and the equipment needed is readily available. AS

8 E 267
Dielectric properties of materials for microwave processing - tabulated.
Tinga, W. R.; Nelson, S. O.
Journal of Microwave Power **8** (1) 23-65 (1973) [82 ref. En] [Dept. of Electrical Eng., Univ. of Alberta, Edmonton, Canada]

A brief description is given of the dielectric dispersion and relaxation as a function of frequency and temp. Important aspects of the behaviour of dielectric mixtures with respect to frequency, temp., and composition are summarized. The dielectric constant and loss factor of many materials (including food) are tabulated as functions of frequency, temp., moisture content, and composition. The data were collected for use in the application of microwaves to non-communication uses. AS

10 E 316
[Microwaves and their use in food processing.]
Mikrowellen in der Lebensmittelbereitung. [Review]
Spreng, H.
Lebensmittel-Wissenschaft + Technologie **6** (3) 77-85 (1973) [131 ref. De] [Lab. für Verfahrenstechnik der Lebensmittelbereitung, Eidgenössische Tech. Hochschule, 8006 Zürich, Switzerland]

10 E 317
[Method and apparatus for sterilizing heat-sensitive products by electro-magnetic heating.]
Stenström, L. A. (Alfa-Laval AB)
Swedish Patent Application 352 229 (1972) [Sv]

Separate units of a packaged food product, e.g. vacuum-packaged minced meat, are sterilized or pasteurized by preliminary heating to ≥50°C (preferably 60-70°C), during which process contact with a liquid (aqueous) cooling medium prevents overheating of the outer layers with respect to the centre of each unit, followed by heating to sterilizing or pasteurizing temp. by microwaves at approx. 10^9 Hz. W&Co

10 E 345
Hospital feeding via microwave kitchenettes. A cost analysis.
Keefe, R. T.; Goldblith, S. A.
Food Technology **27** (8) 16, 18-19, 22-23 (1973) [7 ref. En] [Dept. of Nutr. & Food Sci., Massachusetts Inst. of Tech., Cambridge, 02139, USA]

A microwave/convenience meal system is described in which individually frozen, precooked meals are reconstituted in patient ward kitchenettes using microwave ovens. Comparative costs of the new system together with the costs of the conventional system now employed by a large hospital are presented. Savings for the food service administration are demonstrated in both of 2 proposed systems using 2 types of labour. IFT

11 E 387
The impact of microwaves on the future of the food industry: domestic and commercial microwave ovens.
McConnell, D. R.
Journal of Microwave Power **8** (2) 123-127 (1973) [En] [Amana Refrigeration Inc., Amana, Iowa 52203, USA]

450 000 microwave ovens were present in US homes in 1972, representing 0.7% saturation, and this figure is expected to pass 3 million within the next 5 yr. Expansion of the market can be encouraged by listing microwave cooking directions on the package of suitable existing food products, using a package compatible with the microwave oven such as high temp. plastics and paperboards, revision of formulations of some products such as cake mixes to give better results in a microwave oven, and designing new convenience food products especially to take advantage of the characteristics of the microwave oven. The commercial microwave market is increasing at approx. 10%/yr and sales were estimated at 18 000 units in 1971. PG

11 E 388
Microwave food applications in the United Kingdom: domestic and commercial microwave ovens.
Giles, P. G.
Journal of Microwave Power **8** (2) 129-132 (1973) [En] [Communications Group, C.A.L., Mullard Mitcham, New Road, Mitcham Junction, Surrey CR4 4XY, UK]

Trends in the market for domestic and commercial microwave ovens in the UK are discussed, with reference to sales, required power output and unsuccessful commercial applications. PG

11 E 389
The applications of microwave power in the food industry in the United States.
Schiffmann, R. F.
Journal of Microwave Power **8** (2) 137-142 (1973) [12 ref. En] [Bedrosian and Associates, Alpine, New Jersey, USA]

Many promising commercial applications of microwave power in the food industry are no longer operative because of improper projections of real economic gain, poor reliability of equipment, high cost of replacement and servicing, developing technologies in conventional heating equipment and high capital and operational costs. The most successful applications of microwave power, which include doughnut proofing and frying, pasta drying, meat tempering, chicken precookers and bucan cooking systems, are reviewed. PG

11 E 390
Microwave applications to food processing and food systems in Europe.
Meisel, N.
Journal of Microwave Power **8** (2) 143-148 (1973) [3 ref. En] [Les Micro-Ondes Industrielles, 78-Epone, France]

Past problems in industrial applications of microwave technology in the food industry in Europe, and present work in England, France, Sweden and the Federal Republic of Germany is described. Processes in operation or under development include vacuum driers, bread pasteurization, freeze-drying and tempering of frozen foods. PG

11 E 391
Applications of microwave power to the food industry in Japan.
Suzuki, T.; Oshima, K.
Journal of Microwave Power **8** (2) 149-159 (1973) [8 ref. En] [Tube and Semiconductor Div., Tokyo Shibaura Electric Co., Ltd., Japan]

Applications of microwave heating in the food industry in Japan are discussed, including sterilization, mould inhibition, defrosting, puffing, drying, and roasting of various foods including laver, nuts and fish. PG

11 E 392
Why did they fail? A backward look at microwave applications in the food industry.
O'Meara, J. P.
Journal of Microwave Power **8** (2) 167-172 (1973) [En] [34 Ivy Drive, Orinda, California 94563, USA]

Reasons for failures in the food industry applications of microwave power are reviewed, and include high capital cost of industrial microwave equipment, high operating costs, short and unpredictable magnetron life and other electronic failures, misreading of the market opportunities and technological advances in other conventional heating systems. A typical case, that of microwave finish drying of potato chips, is described in detail. PG

11 E 393
The future of microwave heating equipment in the food industries.
Freedman, G.
Journal of Microwave Power **8** (2) 161-166

(1973) [En] [Raytheon Co., New Products Centre, Foundry Ave., Waltham, Massachusetts 02154, USA]

Problems of microwave applications in the food industry are discussed, with special reference to the effects of hostile environmental conditions such as cleaning procedures, exposure to very high and low temp., and contamination with flour or fat. PG

11 E 394

The necessary ingredients for successful microwave applications in the food industry.

Bedrosian, K.

Journal of Microwave Power 8 (2) 173-178 (1973) [En] [Bedrosian and Associates, Alpine, New Jersey, USA]

Recommendations are given for evaluation of the suitability of microwave processes for food industry applications. PG

11 H 1750

Mathematical model for microwave freeze-drying of spherical particles.

Passey, A. D.; Riel, R. R.; Boulet, M.

Proceedings of the International Congress of Refrigeration (13th Washington) 2, 347-355 (1971, publ. 1973) [10 ref. En, fr] [Dept. of Food Sci., Laval Univ., Quebec, Canada]

Modifications of a previously proposed mathematical model for convective heat transfer freeze-drying are presented. The convective model has been modified to incorporate the microwave energy transfer to the freeze-drying core of spherical particles to examine the improvement in the rate of atomization freeze-drying. Work is being carried out on microwave atomization freeze-drying of coffee extract. AA

11 J 1704

Microwave finish drying of potato chips.

Porter, V. L.; Nelson, A. I.; Steinberg, M. P.; Wei, L. S.

Journal of Food Science 38 (4) 583-585 (1973) [11 ref. En] [Dept. of Food Sci., Univ. of Illinois, Urbana, 61801, USA]

The effect of microwave finish drying of potato chips on their texture, colour and oil content was studied. The intermediate moisture content (IMC) of the chips before microwave application and the reducing sugar content of the raw potatoes were the primary variables. The slices were individually submerged in oil at 320°F to various IMC and finish dried with 2500 W microwave power for 1-3 min. Chip colour was rated against PCII Color Standards. Texture was evaluated subjectively by a panel and objectively by the LEE Kramer Shear Press. Oil determination was made by Soxhlet extraction. The results showed that potato chips removed from the oil at IMC above 13% were unacceptably tough after microwave drying. Potatoes containing >0.9% reducing sugar had to be removed from the oil at IMC above 13% in order to obtain acceptable colour of the microwave-finished product. Therefore, microwave finishing raises the limiting reducing sugar content from about 0.4 to about 0.9%. Oil content of microwave-finished chips was 90% that of conventional controls. IFT

11 S 1276

Flavour and chemical characteristics of conventionally and microwave reheated pork.

Penner, K. K.; Bowers, J. A.

Journal of Food Science 38 (4) 553-555 (1973) [20 ref. En] [Dept. of Foods & Nutr., Kansas St. Univ., Manhattan, 66506, USA]

Sensory evaluations and chemical measurements were made of freshly cooked (conventionally heated), conventionally-reheated (after 5 wk frozen storage), and microwave-reheated pork loin muscle. Freshly cooked and microwave-reheated pork had sweeter aroma and less metallic flavour than conventionally-reheated pork. Microwave-reheated pork was less juicy than pork heated by the other treatments. Freshly cooked pork had the lowest thiobarbituric acid values and the highest moisture content. Heating treatments did not affect ninhydrin-reactive compounds or N content in the various extracted protein fractions. IFT

11 S 1297

Acceptability of microwave reheated precooked chicken after packaging, freezing and storing.

Sison, E. C.; Dawson, L. E.; Payne, E.

Poultry Science 52 (1) 70-73 (1973) [7 ref. En] [Dept. of Food Sci. and Human Nutr., Michigan St. Univ., East Lansing, 48823, USA]

Chicken pieces were breaded and precooked in corn oil under pressure, individually packaged, frozen, stored for 3 months, reheated in a microwave oven and evaluated by a taste panel. Variations in freezing rates were accomplished by freezing in air at -37°C (air blast) or with Freon-12 (-42°C). Packaging variables included bulk packaging in polyethylene bags; packaging individual pieces in Saran-Mylar-laminate pouches before and after freezing; air packaging in Al trays with coated paper lids; and coating pieces with acetylated monoglyceride, followed by packaging in Al trays. Storage variables included constant -18°C and fluctuating temp. The microwave reheated pieces were equally acceptable when bulk packed in polyethylene bags or vacuum packaged in Saran-Mylar laminated pouches. Results were similar for those frozen by air-blast or using Freon-12. Air packaged pieces had significantly lower juiciness, flavour and general acceptability scores than pieces from other packaging treatments, and those held at constant temp. had significantly higher scores than did those held under fluctuating temp. AS

11 S 1298
Acceptance of precooked frozen chicken reheated by microwave energy.
Sison, E. C.; Dawson, L. E.; Payne, E.
Poultry Science **52** (1) 28-34 (1973) [20 ref. En] [Dept. of Food Sci. and Human Nutr., Michigan St. Univ., East Lansing, 48823, USA]

Chicken pieces, which had been breaded and precooked under pressure in corn oil and frozen, were reheated in a microwave oven and evaluated for acceptability. The pieces were dipped in an egg wash, breaded, browned and cooked at 1.05 kg/cm^2 for 9.5 min. Cooked pieces were frozen using air blast (-37°C), N_2 (-57°C) or Freon-12 (-43°C), packaged in polyethylene bags and stored at -18°C for periods up to 6 months. Some samples were subjected to fluctuating storage temp. After storage, the chicken was reheated for 1.5-2.0 min/piece or 1 min/100 g and evaluated by a taste panel. Microwave energy provided a rapid method for thawing and reheating precooked and frozen chicken. Optimum reheating time for the oven used was 1 min/100 g product. Products remained acceptable for >4 months when stored under constant -18°C temp. Rapid freezing rates (N_2 vapour, Freon-12) did not increase acceptability of product over that frozen in air at -37°C. AS

12 G 584
Lipid changes in egg yolks and cakes baked in microwave ovens.
Schiller, E. A.; Pratt, D. E.; Reber, E. F.
Journal of the American Dietetic Association **62** (5) 529-533 (1973) [14 ref. En] [Dept. of Foods. and Nutr., Purdue Univ., West Lafayette, Indiana, USA]

Lipids were extracted from egg yolk samples heated to approx. 80°C by conventional and microwave heating at 915 MHz and 2450 MHz. No changes in fatty acid composition were noted, and there was no measurable decrease in polyunsaturated fatty acids as a result of any of the 3 heat treatments. Samples heated by conventional methods did show significantly ($P<0.01$) higher levels of lipid oxidation as measured by TBA (thiobarbituric acid) numbers. Oxidation levels were significantly ($P<0.05$) higher for samples heated by microwaves at 2450 MHz as compared with those heated at 915 MHz. Apparently microwaves do not interact strongly with lipid molecules to initiate hydrolysis or autoxidation in this food system. Cakes baked in conventional and microwave ovens were analysed, and oxidation levels were significantly ($P<0.05$) higher in cakes baked in the microwave oven operating at 915 MHz than in the conventional oven. There were no significant differences in TBA values for cakes baked in the 2 microwave ovens. AS

12 M 1524
[Effect of heat treatment on the nutritive value of rice proteins.]
Alekaev, N. S.
Voprosy Pitaniya No. 3, 68-73 (1973) [14 ref. Ru, en] [Moskovskii Inst. Narodnogo Khozyaistva imeni G. V. Plekhanova, Moscow, USSR]

Polished Dubovskii 129 rice was cooked traditionally (water:rice ratio, 2.1:1; cooking time, 58 min) or in a super high-frequency cooker (water:rice ratio 375 ml:150 g, water added in 2 stages, cooking time, 8 min 10 s). Changes in rice proteins due to heat treatment were assessed by Sephadex gel filtration; protein digestibility was measured by incubation with crystalline pepsin and trypsin, and amino acid composition was determined using a Beckman amino acid analyser. It is concluded from tabulated and graphically presented results that effects of both methods of heat treatment were slight, the cooked rice proteins showing rather better in vitro digestibility and little change in amino acid content or composition. Super high-frequency cooking was, if anything, the more conservative of the 2. SKK

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J. NEWTON,
ASSISTANT EDITOR

1

Comparative effects of ethylene oxide, gamma irradiation and microwave treatments on selected spices.
Vajdi, M.; Pereira, R. R.
Journal of Food Science **38** (5) 893-895 (1973) [6 ref. En] [Dept. of Food Sci., Univ. of Manitoba, Winnipeg, Canada]

This study involved microbiological, chemical and physical effects of gamma irradiation, ethylene oxide and microwaves on 6 ground spices (black pepper, paprika, oregano, allspice, celery seeds and garlic) and their effects on quality of garlic sausage containing such spices. In general, gamma irradiation was most effective for destruction of bacterial flora in spices. Ethylene oxide treatment affected oil content of spices and colour of paprika, while gamma irradiated spices indicated no change following radiation. With respect to garlic sausage, microbiological examinations indicated highest increase in sausages made with untreated spices followed by ethylene oxide treated and gamma irradiated spices during storage at different conditions of incubation. Flavour analysis indicated no significant difference among sausages. However, preference analysis indicated that the panel preferred sausages made with the gamma irradiated spices to ethylene oxide treated samples. IFT

2

Hot water and microwave energy for precooking chicken parts: effects on yield and organoleptic quality.
Culotta, J. T.; Chen, T. C.
Journal of Food Science **38** (5) 860-863 (1973) [15 ref. En] [Dept. of Poultry Sci., Mississippi St. Univ., State College, 39762, USA]

Precooking chicken parts in hot water and by microwave energy was studied. Precooking times and temp., effects of microwave oven load, % yield and organoleptic quality were determined. All chicken parts precooked by water at 85.0, 87.8 and 90.6°C had significantly lower cooking losses than those precooked by the microwave oven. Volatile fraction accounted for the greatest amount of total cooking loss for parts precooked in the microwave oven. Precooking treatments significantly influenced taste panel rating for flavour, juiciness and tenderness of both dark and white meat. Microwave cooked white meat received lower acceptability scores (higher values), and dark meat for both precooking methods received the higher palatability ratings (lower values). IFT

3

Microwave heating of foods - use and safety considerations. [Review]
Kalafat, S. R.; Kroger, M.
CRC Critical Reviews in Food Technology **4** (2) 141-151 (1973) [26 ref. En] [Cascade Air Pollution Control Program, Great Falls, Montana, USA]

The principles of microwave heating of foods are reviewed under the headings: application of microwaves; development and construction of microwave ovens; heating principle of the microwave oven; polarized molecules and food penetration; the first cooking model and the present model; effects of microwaves on foods; and current use of microwave heating. Potential dangers from microwave ovens are discussed with special reference to methods employed for safety testing and biological effects and hazards. AA

4

Advances in choke design for microwave oven door seals.
Osepchuk, J. M.; Simpson, J. E.; Foerstner, R. A.
Journal of Microwave Power **8** (3/4) 295-302 (1973) [6 ref. En] [Raytheon Res. Div., Waltham, Massachusetts 02154, USA]

5

Experimental results for combinational microwave and hot air drying.
Bhartia, P.; Stuchly, S. S.; Hamid, M. A. K.
Journal of Microwave Power **8** (3/4) 245-252 (1973) [4 ref. En] [Univ. of Manitoba, Winnipeg, Canada]

The efficiency, drying rate and energy requirements of air-drying, microwave drying and combined microwave-air drying were investigated in a preliminary series of trials with materials of different hygroscopicity (sand, potato starch and silica gel). Results suggest that the combined method is the most rapid and efficient, especially for materials of low moisture content and high hygroscopicity AJDW

6

A new method for the measurement of grain moisture content by the use of microwaves.
Okabe, T.; Huang, M. T.; Okamura, S.
Journal of Agricultural Engineering Research **18** (1) 59-66 (1973) [4 ref. En] [Dept. of Electronic Eng., Shizuoka Univ., Hamamatsu, Japan]

Comparison and deflection type instruments are described for measuring the moisture content of grain using microwaves of a frequency of 9.4 giga-Hz. At this frequency, the attenuation of the microwave is independent of the salt content of the grain. Compared with conventional meters (e.g. those that measure changes in resistance at low frequencies) the microwave meters have the advantage that the measurements are not affected by the moisture distribution gradient in the grain. The error of the microwave method was found to be ±0.5% for samples of rice and wheat containing 10 30% moisture. The deflection type of meter is portable and easy to operate. MEG

7

Microwave heating vessel.
Yamauchi, N.; Ishino, K.; Yokoyama, I. (Nippon Toki Kabushiki Kaisha; T. D. K. Electronics Corp.)
United States Patent 3 773 669 (1973) [En]

Cooking utensil for use in heating food in a microwave oven is produced from a sintered body obtained by firing a mixture of ferrite powder and eucryptite powder. IFT

8

Mathematical simulation of a freeze drying process using microwave energy.
Ma, Y. H.; Peltre, P.
AIChE Symposium Series **69** (132) 47-54 (1973) [17 ref. En] [Dept. of Chem. Eng., Polytechnic Inst., Worcester, Massachusetts 01609, USA]

A mathematical model is presented to describe the process of freeze-drying using microwave dielectric heating. The transient mass and energy transfer equations are considered both for the dried and frozen layers. These coupled equations are solved numerically to provide drying rate curves as well as temp. and concn. profiles in both frozen and dried layers. Results obtained from mathematical simulation indicate that drying time can be reduced by approx. 4 times that required in a conventional freeze-drying process. Simulation also shows that hot spots may be created in the ice core and in the dried layer; thus it is necessary to regulate microwave power input to avoid the possibility of thermal degradation of the dried material as well as melting of the ice. Under the assumptions and conditions employed in this investigation, the initial temp. of the frozen material does not have any appreciable effect on drying time. The sample used in the simulation was assumed to be a sample of lean beef sirloin with 75% moisture and 0.9% fat. AA

9

Microwave and R. F. heating in the food industry.
United Kingdom, British Food Manufacturing Industries Research Association
Symposium Proceedings. British Food Manufacturing Industries Research Association
No. 10, 36pp. (1971) [16 ref. En] Price £2.50 [Randalls Road, Leatherhead, Surrey, UK]

Papers presented at a symposium on microwave and R. F. heating in the food industry, held in London on 22 Sept. 1971, were: Introduction to the principles of dielectric and microwave heating, by A. G. Seale (pp. 1-9); Microwave processing in the food industry, by R. J. Meredith (pp. 10-14); High frequency conveyorized dielectric heating in the food industry, by J. M. Holland (pp. 15-20); A semi-automatic method for the determination of biscuit moisture content using R. F. energy, by P. Wade (pp. 21-23); The processing of meat and baked products using microwaves, by K. A. Evans (pp. 24-28); and Effects of high-frequency energy on microorganisms by B. Jarvis & A. P. Rawlinson (pp. 29-36, 16 ref.). VJG

10

[Microwave drying of mushrooms.]
Kaczmarek, R.; Sobiech, W.
Przemysl Spozywczy **27** (11) 524-527 (1973) [11 ref. Pl, ru, en, fr, de] [Inst. Tech. Zywnosci Pochodzenia Roslinnego, AR, Poznan, Poland]

500-g samples of cultivated mushrooms were blanched at 90°C for 4 min and dried in a conventional laboratory drier (inlet air temp., 60°C; drying time, 10 h); or in a K-1 'Agata' microwave oven of Polish manufacture (magnetron capacity, 1.5 kW; frequency 2450 MHz) to remove 80% original moisture (55 min at 28°C) and finishing drying in the conventional drier (30-60 min at 60°C) to avoid microwave scorching in the last stages. The microwave oven product was organoleptically superior to the conventional and reconstituted better. It is considered that with a suitably controlled oven, drying time could be reduced 10-12 × in comparison with the conventional procedure. SKK

11

Pasta preparation.
Unilever Ltd.
British Patent 1 333 324 (1973) [En]

Process is described in which "green" wheat flour pasta is dried initially in a controlled atmosphere to a moisture content of 18-28% and then further dried by the application of microwave energy which also partially gelatinizes the starch. IFT

12

Baking with microwave energy.
Lorenz, K.; Charman, E.; Dilsaver, W.
Food Technology **27** (12) 28-30, 32, 34, 36 (1973) [11 ref. En] [Dept. of Food Sci. and Nutr., Colorado St. Univ., Fort Collins 80521, USA]

Feasibility of baking products for which crust colour formation is not an important factor by microwave energy using specially designed and manufactured plastics baking pans (Plexiglas) was studied. Effects of shortening level, fermentation, proofing and baking times were investigated. Optimum conditions were established for whole wheat bread, rye bread, white and whole wheat brown-and-serve rolls, high protein bread and Boston brown bread. Products baked in the microwave oven without additional heating in a convection oven were compared with products from the same dough processed by conventional procedures. Comparisons were made of softness and moisture content after storage at room temp. for 1, 2, 4 and 7 days. Texture and flavour were evaluated by test panel and colour differences were observed. For microwave baking, no change in formulation is necessary for breads or rolls, but fermentation and proofing times must be decreased. Stiffer than normal doughs are required for cookies processed by microwaves. Cookie doughs should not be refrigerated before baking or contain nuts or raisins. Plexiglas pans can withstand a short exposure in a convection oven for crust colour formation. VJG

13

[Comparison of microwave and conventional methods for thawing of frozen fish.] Auftauen von Gefrierfisch im Hochfrequenzfeld und Vergleichsweise mit konventionellen Verfahren.
Flechtenmacher, W.; Christians, O.
Informationen für die Fischwirtschaft **20** (4/5) 142-145 (1973) [De] [Inst. für Biochem. & Tech., Hamburg, Federal Republic of Germany]

6.5 cm thick blocks of frozen white fish fillets and 7 cm thick blocks of frozen herrings were microwave-thawed (13.6 MHz) for 30-40 min, thawed in warm (20°C) water for approx. 3 h or thawed in air at room temp. for approx. 10 h. Results showed that microwave-thawed white fish fillets were of significantly better appearance and organoleptic properties than conventionally-thawed samples. Microwave-thawed herrings had a considerably lower drip loss than conventionally thawed samples; no significant difference in wt. loss was observed after marinating of the herrings. Microwave-thawed marinated herrings had a lower flesh firmness value and lighter colour than conventionally thawed specimens. AJDW

14

New equipment/techniques produce high quality seafood products.
Ammerman, G.; Andres, C.
Food Processing **34** (10) 76-79 (1973) [En]

Advances in fish processing operations are discussed with reference to: vacuum evisceration of fish; microwave thawing of frozen blocks of fish; chemical (NaOH) skinning of frozen fish; and recovery of flesh from the fish skeleton using a meat separator. AA

15

Moisture and microwave effects on selected characteristics of turkey pectoral muscles.
Crews, G. W.; Goertz, G. E.
Poultry Science **52** (4) 1496-1500 (1973) [9 ref. En] [Dept. of Food Sci., Univ. of Tennessee, Knoxville, 37916, USA]

The effects of added water and microwave heating on the water holding capacity expressed as expressible moisture index (EMI), total moisture content, cooking losses and pH of USDA grade A turkey toms were studied. 200 g samples of ground composites of pectoral muscles with 0, 15 or 30 ml added water were heated in a microwave oven for 0, 70 or 130 s. The 15 and 30 ml samples represented 7 and 13% added water; end point temp. after heating for 70 and 130 s were 44-47 and 61-64°C. EMI was the best measure of treatment effects; % variation was greater for EMI than for measures of cooking loss and total moisture content. Total moisture values indicated water loss during cooking, but some added water was retained. Cooking time caused the gratest % variation; added water also significantly affected all the factors studied. AS

16

[Method and apparatus for sterilizing heat-sensitive product by electro-magnetic radiation.]
Stenström, L. A. (Alfa-Laval AB)
Swedish Patent Application 352 230 (1972) [Sv]

Separate units of a packaged food product, e.g. vacuum-packaged minced meat, are sterilized or pasteurized by subjecting them to microwaves of 10^9 Hz, while a uniform temp. level is maintained in the product by surrounding it with a liquid cooling medium which has a dielectric constant at least half that of the product units for the field applied. The starting temp. of the surrounding medium is adjusted such that its temp. after microwave heating is approx. the same as the achieved sterilizing or pasteurizing temp. of the product. W&Co

17

Food science. [Book]
Potter, N. N.
2nd edition xiv+706pp. ISBN 0 87055 140 X (1973) [many ref. En] Westport, Connecticut, USA, AVI Publishing Co. Inc. Price $15 (USA), $16 (Foreign) [Dept. of Food Sci., Cornell Univ., Ithaca, New York, USA]

This 2nd edition, which largely retains the format of the first edition published in 1968 [see FSTA (1969) **1** 3G95], has been updated and expanded. Many sections have been added or modified to bring in new subject material and a new chapter on improving nutritional quality and nutritional labelling has been added. Additions have generally been kept short so as not to exceed a book length appropriate to a single volume. Chapters are: Introduction: defining food science (pp. 1-14, 28 ref.); Magnitude, division, and interdependent activities of the food industry (pp. 15-35, 24 ref.); Constituents of foods: properties and significance (pp. 36-58, 31 ref.); Nutritive aspects of food constituents (pp. 59-80, 28 ref.); Unit operations of the food industry (pp. 81-104, 16 ref.); Quality factors and how they are measured (pp. 105-130, 24 ref.); Deteriorative factors and their control (pp. 131-155, 31 ref.); Heat preservation and processing (pp. 156-186, 31 ref.); Cold preservation and processing (pp. 187-237, 35 ref.); Food dehydration and concentration (pp. 238-297, 42 ref.); Food irradiation and microwave heating (pp. 298-328, 27 ref.); Food fermentations (pp. 329-345, 25 ref.); Milk and milk products (pp. 346-390, 29 ref.); Meat, poultry, and eggs (pp. 391-423, 44 ref.); Seafoods (pp. 424-439, 27 ref.); Fats, oils, and their products (pp. 440-462, 27 ref.); Cereal grains and their processing (pp. 463-487, 27 ref.); [Continued in following abstr.]

18

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Potter, N. N.
2nd edition xiv + 706pp. ISBN 0 87055 140 X (1973) [many ref. En]

[Continued from preceeding abstr.] Vegetables, fruits and juices (pp. 488-517, 31 ref.); Beverages (pp. 518-550, 45 ref.); Confectionery and chocolate products (pp. 551-566, 21 ref.); Food packaging (pp. 567-602,37 ref.); Water and waste (pp. 603-621, 38 ref.); Food additives, wholesomeness, and consumer protection (pp. 622-651, 34 ref.); Improving nutritional quality: nutritional labeling (pp. 652-665, 19 ref.); and World food needs (pp. 666-687, 27 ref.). JA

19

Flour Milling and Baking Research Association.
Kent, N. L.
Nutrition and Food Science No. 34, 6-8 (1974) [En]

The work of the Flour Milling and Baking Research Association is described with reference to: to development of the "RAPID" meter (Research Association Protein Indicator Device) which quickly determine the protein content of wheat by a dye-binding test, using the dye Solway Green G-150; an automatic control mechanism for damping wheat; studies on the activated dough development process for breadmaking; and investigations into the application of novel baking methods using microwave energy. AA

20

Freeze-drying of solid materials with radiation and microwave heat supply.
Havelka, J.
Proceedings of the International Congress of Refrigeration (13th Washington) **3**, 725-737 (1971, publ. 1973) [12 ref. En, fr] [Agric. Univ., Nitra, Czechoslovakia]

Thermodynamic principles concerned with the freeze-drying of foods are described with the aid of analytical structural models in which either radiant or microwave heat is supplied during sublimation. Equations and graphs are derived for controlling the drying process, and as an illustration, changes in wt. and temp. of the material to be dried, total pressure in the drying chamber, temp. of the heating elements, partial water vapour pressure and calculated mass flow intensity occurring during freeze-drying of milk are presented in graphical form. MEG

21

Amendments to the US Department of Health, Education, and Welfare microwave oven performance standard.
Griek, A. van de; Britain, R.
Journal of Microwave Power **9** (1) 3-11 (1974) [En] [Bureau of Radiological Health, FDA, Rochville, Maryland 20852 USA]

Brief details are given of studies conducted on radiation emission from microwave ovens, failure of microwave oven door safety interlocks and installation of safety interlock monitoring devices, with special reference to recent legislation in the USA. AJDW

22

[Method for heating a product unit in an electromagnetic field of the lowest microwave frequency.]
Stenström, L. A. (Alfa-Laval AB)
Swedish Patent Application 355 479 (1973) [Sv]

To avoid undesirable chemical reactions causing deterioration of taste by overheating of the outer layers of packaged portions of a food product during sterilization by an HTST process employing microwaves, the packaged units are surrounded in the electromagnetic field, at least along its outer surfaces positioned perpendicular to the direction of main application of the field, by a medium having a dielectric constant which is at leasr $\frac{1}{2}$ that of the packaged unit for the field in question. The outer layers of the unit are cooled during the electromagnetic heating by controlling the temp. of the surrounding unit such that at the end of the process all parts of the product have the same predetermined temp. Preferably, an electromagnetic energy absorbing, liquid (aqueous) medium is introduced into the field at a temp. such that it has reached the predetermined temp. when the treated units leave the field. This method is particularly suitable for solid food products to which, up to now, HTST sterilization processes could not be satisfactorily applied, e.g. portions of minced meat vacuum-packed in a thin transparent material permeable to microwaves. Microwaves of the lowest range (frequencies approx. 10^9 Hz) are used in this process. W&Co

23

Paper withstands oven heating.
Anon.
Food Processing **35** (1) 36 (1974) [En]

A brief description is given of a recently introduced leak-proof heat-resistant carton. The cartons, with a viewing window, will withstand oven temp. of 400°F for ≥30 min and 350°F for ≥1 h. Evaluation of the carton for use in microwave ovens gave excellent results. The carton has web corners, and features outer and inner plastics coatings, with a grease-resistant inner coating. The package will also withstand freezing temp. Thus the product can be formulated, packaged in the carton, frozen, stored and sold through supermarket outlets in one package. AA

24

Microwave dielectric properties of grain and seed.
Nelson, S. O.
Transactions of the ASAE **16** (5) 902-905 (1973)

[24 ref. En] [Agric. Eng. Dept., Univ. of Nebraska, Lincoln, USA]

Dielectric properties of several kinds of grain and seed (wheat, grain sorghum, oats, soybean) were measured at microwave frequencies of 1.0, 5.36 and 12.08 GHz and their dependence on moisture content was considered. In the frequency range 1-5.5 GHz, both the dielectric constant and dielectric loss factor of hard red winter (HRW) wheat increased almost linearly with moisture contents between 6 and 21% when measured at natural bulk densities. The dielectric constant of HRW wheat decreased somewhat with increasing frequency in the 1 to 5.5 GHz range and was more dependent on frequency at higher moisture content. Dielectric loss factor showed little frequency dependence in this range, but increased with frequency at high moisture levels. Microwave dielectric properties varied considerably between different kinds of grain and crop seed. Both dielectric constant and loss factor were greater for samples of higher bulk densities and higher equilibrium moisture contents. RM

25

[Systems of meal distribution.] Speisenverteilungs-Systeme.
Rademacher, R.
Ernährungs-Umschau **20** (8/9) 380-382, 384 (1973) [De] [5 Cologne 41, Zülpicher Str. 261, Federal Republic of Germany]

This article, forming part of an abridged version of a prize essay by the author, deals with hospital central kitchens and mobile canteens, Regethermic, Multimet and Nacka systems of hospital meal distribution, with deep frozen meals and their microwave preparation for consumption and with the Krefft cooking line incorporating an endless conveyor for meal portioning. [See also following abstr.] SKK

26

[Possibilities of meal distribution and their evaluation.] Möglichkeiten der Speisenverteilung und ihre Beurteilung.
Rademacher, R.
Ernährungs-Umschau **20** (11) 462-463 (1973) [7 ref. De]

This final part of the abridged version of the author's essay [see 2 preceding abstr.] deals with self-service cafeterias of different types and with meal warming methods of which the Regethermic system [see preceding abstr.] is considered the most promising. Automatic distribution of frozen meals including, in the more sophisticated version, programmed microwave warming is considered; and, finally, advantages and disadvantages of the various systems of meal distribution in hospital or factory described by the author are briefly discussed. This article contains general bibliographic references for the 3 articles. SKK

27

Dielectric properties of wheat at microwave frequencies.
Chugh, R. K.; Stuckly, S. S.; Roepecka, M. A.
Transactions of the ASAE **16** (5) 906-909, 913 (1973) [14 ref. En] [Agric. Eng. Dept., Univ. of Manitoba, Winnipeg, Canada]

Dielectric properties of Neepawa hard red spring wheat were studied at 2.45 and 9.4 GHz at several moisture contents, temp. and densities. Dielectric constant and loss factor were dependent on temp., moisture and density and had positive temp. coeff. at -20° to +80°C, 0.5-25% moisture. Loss factor at 2.45 GHz first increased and then decreased with temp.; temp. of max. loss increased with moisture from 35°C at 2.8% to 80°C at 23%. Both parameters changed smoothly through 0°C at both frequencies and up to 25% moisture, and increased linearly with moisture at both frequencies and all temp. At corresponding moisture and temp., dielectric constant was higher at 2.45 GHz, and loss factor at 9.4 GHz. Dielectric losses at microwave frequencies for dry or almost dry wheat were very small and of polar origin with relaxation frequency well below microwave region at about 10^6 Hz, and similarly for wet wheat at 10^7-10^9 Hz (attributed to bound water). Up to 25% moisture, water is predominantly in the bound form and dielectric properties do not change substantially at the fp of free water (0°C). RM

28

Rate of heating as it affects the solubilization of beef muscle collagen.
McCrae, S. E.; Paul, P. C.
Journal of Food Science **39** (1) 18-21 (1974) [15 ref. En] [Food & Nutr. Dept., Univ. of Nebraska, Lincoln, 68503, USA]

Comparison was made of effects of 4 heating rates produced by microwave heating, oven broiling, braising and roasting to 70°C, and increased exposure to heat by braising to 98°C plus ½ h holding at that temp., on cooking losses, composition, collagen extractability, shear force, penetration and microscopic appearance of cuts of beef semitendinosus. Microwave energy appeared to be more effective in solubilizing collagen than any of the conventional methods at 70°C. However, the longer high temp. exposure with braising to 98°C plus ½ h greatly increased collagen extractability over any of the other methods. Microwave and oven-broiled samples were softest, and braised to 98°C plus ½ h hardest as measured by depth of penetration. Force required to shear did not vary significantly among the various treatments. The changes observed by microscopic examination tended to support the indications that rapid heating with microwave energy influences both contractile and connective tissues differently than does the slower heating by conventional methods. IFT

29

Effect of microwave heating of precooked chicken on Clostridium perfringens.
Craven, S. E.; Lillard, H. S.
Journal of Food Science 39 (1) 211-212 (1974) [14 ref. En] [USDA, Richard B. Russell Agric. Res. Center, PO Box 5677, Athens, Georgia 30604, USA]

Precooked chicken thighs inoculated with Cl. perfringens vegetative cells or with spores were heated by microwaves to internal temp. which ranged from 49 to 84°C. Recovery of vegetative cells after microwave treatment decreased markedly with increasing internal temp. Viable cells were not recovered from samples heated to 70°C or more either by direct plating on sulphite-polymyxin-sulphadiazine (SPS) agar or by enrichment techniques. Germination of spores was stimulated when samples were heated to max. internal temp. of 49-84°C. IFT

30

Automatic control of wheat damping.
Butcher, J.; Maris, P. I.
Journal of Flour and Animal Feed Milling 155 (12) 16-18 (1973) [1 ref. En, de, fr]

A project involving development of an automatic control system for wheat damping (conditioning), using the AEI Microwave Attenuation Monitor, is described. Results obtained are discussed and were used to design a second more advanced system. A further system is now being developed with a feed-forward loop control system for fast response and a feed-back loop to take account of variables such as wheat flow rate and water pressure. In this system, the Microwave Attenuation Monitor is replaced by a solid state microwave moisture meter (MESL Ltd.). [See also FSTA (1970) 2 9M782.] PG

31

New developments in doughnut production equipment.
Moyer, J.
Bakers' Digest 47 (5) 120-122, 135 (1973) [En] [DCA Food Ind. Inc., New York, USA]

New equipment available for doughnut production is described including: a doughnut stamper; a microwave proofer; a microwave fryer; and an automatic doughnut filling unit. AA

32

Prediction of dielectric properties in nonfat milk at frequencies and temperatures of interest in microwave processing.
Mudgett, R. E.; Smith, A. C.; Wang, D. I. C.; Goldblith, S. A.
Journal of Food Science 39 (1) 52-54 (1974) [7 ref. En] [Dept. of Nutr. & Food Sci., Massachusetts Inst. of Tech., Cambridge, 02139, USA]

Studies of dried skim-milk showed that dielectric behaviour can be predicted at 300-3000 MHz, 25-55°C, by the Hasted-Debye models for aqueous ionic solutions, and can be related primarily to moisture and ash contents. Milk conductivity and cation binding levels were found to be essentially constant with temp. An effective dissoved milk salts concn. of approx. 0.1M NaCl equivalents was determined by conductivity measurements. A model correction for dielectric constant predictions due to minor water-binding effects by nonionic constituents was determined from analogue depression measurements. These studies suggest that liquid food systems of low colloidal content behave as aqueous ionic solutions whose dielectric properties may be estimated by the Hasted-Debye models in conjunction with simple conductivity measurements. IFT

33

[Method for heat treatment of meat products in a super high frequency electromagnetic field.]
Bol'shakov, A. S.; Fomin, A. K.; Rogov, I. A.; Zharinov, A. I.; lazarev, A. P.; Korokh, D. A.; Ilyukhina, R. I. **(Union of Soviet Socialist Republics**, Moskovskii Tekhnologicheskii Institut Myasnoi i Molochnoi Promyshlennosti)
USSR Patent 410 753 (1974) [Ru]

In order to prevent excessive evaporation of moisture from the product and to increase yield of finished articles of a given quality, treatment is carried out in several stages and the product is allowed to stand after each stage. The duration of exposure to the field in each stage is preferably ≤3 min, and the product is allowed to stand until the temp. in its centre is 20-25°C after the first stage, 42-45°C after the second, 51-57°C after the third, and 68-72°C after the fourth. W&Co

34

Continuous microwave sterilization of meat in flexible pouches.
Ayoub, J. A.; Berkowitz, D.; Kenyon, E. M.; Wadsworth, C. K.
Journal of Food Science 39 (2) 309-313 (1974) [12 ref. En] [Food Lab., US Army Natick Lab., Massachusetts 01760, USA]

Feasibility studies originated earlier in the authors' laboratory, on microwave energy thermal processing of foods [see FSTA (1971) 3 9E452], were continued. A means of measuring temp. distribution, as well as a photometric method for determining time/temp. integration within thermally processed foods, were developed. A knowledge of the processing parameters involved in the preservation of foods by microwave energy was obtained. Feasibility of the process was demonstrated. IFT

35

Vitamin B_6 in pork muscle cooked in microwave and conventional ovens.
Bowers, J. A.; Fryer, B. A.; Engler, P. P.
Journal of Food Science **39** (2) 426-427 (1974) [5 ref. En] [Dept. of Foods & Nutr., Kansas St. Univ., Manhattan, 66506, USA]

Loin sections of pork muscle were heated to 75 or 85°C internal temp. in microwave or conventional electric ovens. Cooking losses and time, % moisture and total vitamin B_6 were determined. Cooking time was longer, total cooking loss less and moisture content greater for pork cooked is an electric oven than for that cooked in a microwave oven. Differences in vitamin B_6 due to type of oven or internal temp. were small and not significant when calculated on a cooked wt. basis. When calculated on a dry wt. basis samples cooked in the conventional oven contained more vitamin B_6 than did those cooked by a microwave oven. IFT

36

[Study of defrosting of deep frozen and frozen poultry using a microwave oven.] Untersuchungen über das Auftauen von tiefgefrorenem und gefrorenem Geflügelfleisch mit einem Mikrowellengerät.
Terjung, F.
Archiv für Lebensmittelhygiene **25** (3) 62-63 (1974) [De, en] [Veterinäramt des Kreises Heinsberg, Federal Republic of Germany]

A total of 80 specimens of frozen broilers and grillers (wt. range 850-2500 g) were defrosted in a National Electronic Range type NE 6100 (Matsushita Electronic). Broilers were defrosted in 4 × 2 min (being turned by 90° every 2 min) to a point where the birds had thawed throughout but the inserted giblets could easily be removed still frozen. Grillers (weighing approx. 1000 g and without giblets) could be defrosted in 3 × 2 min. Spin-chiller frozen chickens lost 5-10% wt. in defrosting; wt. loss in blast-frozen chickens was only 1-2%. SKK

37

Tuning, coupling and matching microwave heating applicators operating at higher order modes.
Bhartia, P.; Kashyap, S. C.; Stuchly, S. S.; Hamid, M. A. K.
Journal of Microwave Power **6** (3) 221-228 (1971) [12 ref. En] [Dept. of Electrical Eng., Univ. of Manitoba, Winnipeg, Canada]

Details are given of an experimental unit (based on a cylindrical waveguide resonator operating at a higher order mode) for microwave heating of food. Studies on pasteurization of milk showed that the experimental unit permitted a 6 times higher milk flow rate than a conventional type of microwave heating unit. Studies on heating of wieners for approx. 1 min showed that wt. loss due to water evaporation was 5-10%. Slight discoloration and firming of the emulsion was observed, together with localized darkening due to uneven field distribution. This effect could be eliminated by moving the wieners during heating. Development of a commercial-scale unit is briefly discussed. AJDW

38

Drying field corn with microwave power and unheated air.
Fanslow, G. E.; Saul, R. A.
Journal of Microwave Power **6** (3) 229-235 (1971) [5 ref. En] [Dept. of Electrical Eng., Iowa St. Univ., Ames, 50010, USA]

A series of studies on microwave drying of corn is described in which samples of corn in layer 1.3, 2.5 or 5.0 cm thick were microwave heated for 2, 4 or 8 min at 2450 MHz (1.8 kW) or 915 MHz (0.6 kW); during microwave irradiation, unheated air (26, 39 or 52 ft^2/min) was passed through the sample. Tables and graphs of values for the drying rate are given. Results showed that microwave heating, significantly increased the drying rate; the value of this was, however, limited by cracking and puffing of the corn due to an excessive heating rate. This could be minimized by use of large batches of corn and a high air flow rate. Drying rate was not affected by air flow rate or microwave frequency. AJDW

39

Microwave energy in the baking of bread.
Chamberlain, N.
Food Trade Review **43** (9) 8-12 (1973) [4 ref. En] [Flour Milling & Baking Res. Assoc., Chorleywood, Rickmansworth, Hertfordshire WD3 5SH, UK]

The possibility of including a greater proportion of home-grown wheat in bread flour grist without reducing bread quality was investigated. Loaves of good vol. and texture, and normal wt. loss were baked by microwave energy using a catering type oven, frequency 2450 MHz. They lacked a normal crust, had an unnatural appearance and lacked mechanical stability. The quantity of deleterious end-products of amylase action, measured as water-soluble dextrins, was reduced by rapid baking, but [illegible]ame excessively dry. Microwave [illegible]Hz gave increased power penetration depth and a more even moisture distribution. Combined microwave/thermal baked loaf made from biscuit flour (8.9% protein) with added malt (1 lb/sack) gave a better crumb structure than a conventionally baked loaf made from the same flour. It is concluded that bread of good vol., containing lower levels of the end products of α-amylase activity can be made [illegible] the low protein, high amylase flours of home grown wheat, by using microwave energy in baking. Taking into account the additional cost of

microwave energy (42 pence/sack) the process breaks even when the difference in price between domestic and imported wheat is about £4/ton. VJG

40

Determination of emulsion stability by microwave irradiation.
Petrowski, G. E.
Journal of the American Oil Chemists' Society 51 (3) 110-111 (1974) [8 ref. En] [Carnation Res. Lab., Van Nuys, California 91412, USA]

The stability of emulsions has been determined by a microwave irradiation method. After this treatment, the surface temp. of the emulsion tends to be greatest and the temp. difference between the surface and the bottom of the emulsion smallest for the more stable emulsions. These results have been explained in terms of the nature of microwave heating and a partially destabilized emulsion. AS

41

[Dried ground fish product.]
Nippon Suisan Kaisha Ltd.
Japanese Patent 4 904 947 (1974) [Ja]

Ground fish meat is shaped into a slab, which is subjected to microwave heating to reduce its moisture content. The dried product is then rolled to reform the slab and to soften the texture. Microwave heating is employed to produce slow drying from the inside, thereby reducing loss of flavour. IFT

42

Microwave dielectric properties of fishmeal.
Kent, M.
Journal of Microwave Power 7 (2) 109-116 (1972) [7 ref. En] [Dept. of Trade & Ind., Torry Res. Sta., (PO Box 31), 135 Abbey Road, Aberdeen, AB9 8DG, UK]

The microwave dielectric properties of herring meal and white fish meal were investigated as functions of temp. and hydration. It is suggested that the observed loss factor is a result of thermal excitation of monolayer water molecules into multilayer states. This, plus the presence of relaxation processes, gives rise to the observed temp. dependence. An approx. estimate for the heat of sorption from multilayer to monolayer is 6.4 kJ/mol. AS

43

[High frequency defrosting of meat.] Auftauen von Fleisch mittels Hochfrequenz.
Schlusselburg, G.
Fleischwirtschaft 54 (4) 672, 677, 678, 680 (1974) [11 ref. De]

High-frequency thawing of frozen boneless lean beef was studied in a series of studies in which blocks (30 kg) were thawed for 150 min at 13.6 MHz. Details are given of temp. changes at 9 locations in the frozen blocks. After 60-90 min. all parts of the block were heated from the initial temp. of -18°C to an acceptable cutting temp. of -2°C. Wt. losses of quick-frozen and slowly-frozen meat were 0.9-1.0% and 3% respectively, as compared to 8-12% with conventional thawing. Recommendations are given for high-frequency thawing of various pork and beef cuts, and the economics of high-frequency thawing of frozen beef are briefly discussed. RM

44

[Method and device for imparting improved storage properties to a food product.]
Haglund, A. S. C.; Lund-Petersen, K.; Nilsson, B.-G.; Kiellarsson, F. K. A.; Lorant, I. S. (AB Akerlund & Rausing)
Swedish Patent Application 358 546 (1973) [Sv]

In a process for combined heat and microwave treatment followed immediately by packaging of the pre-cooked food (e.g. potatoes or other root products), the treatment is terminated when the product is only partly cooked, i.e. after starch conversion but before the product becomes too soft to withstand further treatment and transport without damage. Preferred treatment temp. are outer temp. of 100-150°C and core temp. of 60-100°C, potatoes preferably being pre-heated to approx. 100°C before microwave treatment. Starchy deposits on potatoes may be prevented by rinsing with softened, chlorinated water at 95-100°C before and/or after microwave treatment. Packaging is carried out while maintaining a steam atm. to exclude O_2, the cooled packages thus obtaining an evacuated appearance. The O_2-impermeable packaging material may be a laminate of polyamide film and polyethylene. The packaged products may be stored at room temp. or under refrigeration. W&Co

45

Effects of water and microwave energy precooking on microbiological quality of chicken parts.
Chen, T. C.; Culotta, J. T.; Wang, W. S.
Journal of Food Science 38 (1) 155-157 (1973) [16 ref. En] [Dept. of Poultry Sci., Mississippi St. Univ., State College, 39762, USA]

Hot water-precooked chicken parts were consistently lower in bacterial count than microwave energy-cooked samples. Surviving bacteria on hot water-cooked samples belonged to either Micrococcus or Staphylococcus. All colonies were nonpigmented. However, in addition to those bacteria found on water-cooked samples, pigmented Staphylococcus and occasionally Gram-positive rods were present on microwave energy-cooked samples. Precooking chicken parts in hot 3% polyphosphate solution resulted in an almost sterile product. Polyphosphates were more effective in controlling growth of Micrococcus and Staphylococcus, which were the principal microbial flora found on the surface of fresh dressed chicken. IFT

46

Stability and acceptability of phosphate-treated and precooked chicken pieces reheated with microwave energy.
Dawson, L. E.; Sison, E. C.
Journal of Food Science 38 (1) 161-164 (1973) [9 ref. En] [Dept. of Food Sci. & Human Nutr., Michigan St. Univ., East Lansing, 48823, USA]

A procedure for precooking and reheating chicken with microwave energy, suitable for a centralized processing operation, was evaluated. Chicken pieces, with and without a sodium polyphosphate marination and precooked using microwave energy and steam followed by breading and browning, were compared with those breaded and precooked in corn oil under pressure. All pieces were individually quick frozen (IQF), packaged and later reheated with microwave energy. Half pieces were stored for 3 months under fluctuating temp. conditions. Prestorage chicken was more acceptable than that held 3 months under fluctuating temp. Phosphate-treated fresh chicken was more juicy and tender than controls, and highest yields were obtained by a combination of phosphate marination and microwave-steam precooking. IFT

47

[Evaluation of meat loaves heated by super-high frequency waves and by traditional methods.]
Nakonechnyi, N. S.; Belova, T. S.; Tkachenko, L. F.
Tovarovedenie 7, 74-76 (1974) [3 ref. Ru]

Meat loaves, made from 68% beef, 30% semi-fat pork and 2% starch and containing 1.5-2.0% cooking salt and condiments, were either heated for 5-7 min (to an internal temp. of 95-97°C) in a super-high frequency oven (1-1.5 kW/kg) or by the traditional rotary oven; 12 loaves were heated by each method. The method of heating had little effect on contents of moisture, dry residue, protein, fat, starch or amino acids (methionine, alanine, arginine, histidine, leucine and isoleucine were somewhat higher in the experimental loaves, while lysine, phenylalanine, valine and tryptophan were somewhat lower); thiamine and riboflavin contents were also slightly higher in the experimental loaves than in the controls. HBr

48

Chemical pasteurization of poultry meat.
Teotia, J. S.
Dissertation Abstracts International, B 34 (9) 4142: Order no. 74-5450 (1974) [En] [Colorado St. Univ., Fort Collins, USA]

Pasteurization of turkey meat and skin (artificially contaminated with Salmonella senftenberg 775W or S. typhimurium) by means of lactic acid, acetic acid, Na_2CO_3, NaCl, KOH, Cl_2, sodium borate, EDTA, lysozyme, X-rays or microwave irradiation was studied. Details are given of the effect of temp., time and dose rate on the bactericidal effects of the treatments. All the chemical pasteurization treatments except NaCl, Na_2CO_3 and sodium borate adversely affected the appearance of the turkey meat; microwave pasteurization produced a partially-cooked appearance of the meat. AJDW

49

Effect of microwave reheating of precooked chicken on Clostridium perfringens.
Craven, S. E.; Lillard, H. S.
Abstracts of the Annual Meeting of the American Society for Microbiology 72, 4 (1972) [En] [Richard B. Russell Agric. Res. Center, USDA, Athens, Georgia, USA]

Since a previous study established the presence of Cl. perfringens in flour, batter, and precooked chicken, this study was designed to evaluate the effect of commercial reheating procedures on this organism. Battered and breaded prefried chicken portions were inoculated with either vegetative cells or heat-resistant spores of a food-poisoning strain of Cl. perfringens. The portions were exposed to microwave radiation for 45-90 s to give internal temp. of 120-180°F. Samples were homogenized in peptone and counts obtained after incubating anaerobically for 24 h at 35°C in SPS agar. A reduction in vegetative cells occurred with increasing temp. with complete destruction occurring at 150-160°F with an inoculum of 10^6 cells/g and 145-155°F with 10^3 cells/g. Outgrowth of spores after microwave treatment at all temp. was similar to outgrowth for untreated controls indicating little or no stimulatory effect. However, when heating by microwaves was followed by heat shocking the homogenate at 75°C for 20 min a significant reduction in counts occurred as compared to controls that were heat shocked only, indicating a change in heat resistance or germination requirements of spores. AS

50

Prediction of dielectric properties in oil-water and alcohol-water mixtures at 3,000 MHz, 25°C based on pure component properties.
Mudgett, R. E.; Wang, D. I. C.; Goldblith, S. A.
Journal of Food Science 39 (3) 632-635 (1974) [18 ref. En] [Dept. of Nutr. & Food Sci., Massachusetts Inst. of Tech., Cambridge, 02139, USA]

Measurements of oil-water emulsions show that dielectric properties are predicted at 3000 MHz, 25°C by the noninteractive Fricke model for complex conductivity of colloidal suspensions. Similar measurements for methanol/water and ethanol/water show that dielectric properties are predicted at 3000 MHz, 25°C by an empirical combination, designated as the interactive Fricke model, of the noninteractive Fricke model and the Debye models for pure polar liquids with single

relaxation times. A tentative physical-chemical basis for prediction of dielectric properties in liquid food systems is suggested, which involves concepts of relative dielectric activities of major chemical constituents, extent of solvation and colloidal content and is based on mechanisms of dielectric behaviour observed in aqueous mixtures at microwave frequencies. IFT

51

[Quality improvement through microwave cooking.]
Qualitätsverbesserung durch Mikrowellenkochen.
Anon.
Industrielle Obst- und Gemüseverwertung **59** (1) 20-21 (1974) [De]

The major characteristics of microwaves, of importance from the food technology viewpoint, are summarized as: their absorption by organic matter and conversion to heat; ability to penetrate glass, porcelain, paper, board and most plastics without loss of power; and rejection by metal surfaces. Losses of vitamin C are lower in precooked, frozen foods heated by microwave to 90°C (6.5%) than by IR heating (9.6%), boiling (14.0%) or by preparing the fresh dish on a steam plate (32.6-21.8%). Compared with conventional methods, microwave heating retains 14% more vitamin C in cauliflower, 7.0% more in tomatoes, 17.0% more in cabbage, and 4.0% more thiamine and 12% more riboflavin in loin steak. HBr

52

Proceedings of the fall 1973 meeting. Technology interface with future military feeding.
United States of America, Research & Development Associates for Military Food & Packaging Systems Inc.
Activities Report **26** (1) vii + 209pp. (1974) [many ref. En]

[Continued from preceding abstr.] Need and rationale for military specifications, by F. P. Mehrlich (pp. 59-63); Changing times and mass feeding and the questionable value of military specifications, by C. K. Wiesman (pp. 64-67); Industry reaction to military specifications, by J. H. Sullivan (pp. 68-71); De-sensitizing specifications, by D. H. Freedman (pp. 71-73); Assessment of the effectiveness of specifications, by J. L. Welbourn (pp. 73-77); The Defense Supply Agency's new look at standardization, by R. D. Svoboda (pp. 77-82); Legal impact of Armed Services Procurement Regulations, by J. P. Mulvihill (pp. 82-85); u.S. Air Force consumer level quality audit program (COLEQUAP), by B. R. Jones (pp. 86-89); The Hellerbond process® - a new option for sealing packages, by A. M. Leatherman (pp. 92-102); Calorimetric detection of food contamination, by R. Lampi & D. A. Mikelson (pp. 103-112); Formed aluminium containers for heat processed foods, by E. H. Kane (pp. 113-117); Mobile field kitchen trailer, by J. Perry (pp. 118-120); Dielectric properties of foods and their importance in processing with microwave energy, by S. A. Goldblith (pp. 121-136, 7 ref.); Feasibility and general concepts of untended meal service, by D. P. Smith (pp. 136-146); Identification of equipment requirements for a central food preparation-satellite food service system, by T. Parks (pp. 146-156).
JA

53

[Research into bread baking conditions in an electromagnetic field of very high frequency.]
Lunin, O. G.; Selyagin, V. E.; Nekrutman, S. V.
Khlebopekarnaya i Konditerskaya Promyshlennost' No. 9, 31-33 (1973) [Ru] [Vses. Zaochnyi Inst. Pishchevoi Promyshlennosti, USSR]

In an electromagnetic field of very high frequency a uniformity of heating is achieved. In the course of bread baking in such a field, very rapid evaporation of bound water takes place and the loaves are baked very quickly. The bread produced has no crust. It is therefore recommended that baking be completed in an IR oven or that a special mixture is used which produces a coloured crust during baking in an electromagnetic field. STI

54

Freezing of cooked meat: influence of freezing rate and reconstitution method on quality and yield.
Jakobsson, B.; Bengtsson, N.
Journal of Food Science **39** (3) 615-619 (1974) [8 ref. En] [Swedish Inst. for Food Preservation Res. (SIK), Fack, S-40021 Goteborg 16, Sweden]

Combined effects of freezing rate, frozen storage and reconstitution method on meat quality and yield were studied in multifactorial experiments using pan-fried 1.5 cm slices of longissimus muscles and deep-fat fried meat patties. On the whole, slight improvement in sensory quality and yield was seen with increasing freezing rate, except that liquid N_2 immersion freezing influenced flavour negatively. In contrast with earlier results with raw beef, an advantage was now seen for reconstitution after previous thawing over reheating directly from the frozen state, and pan frying gave better sensory quality but lower yield than continuous microwave reheating. Tenderness of sliced, cooked beef tended to increase during frozen storage, while the opposite was earlier observed for frozen raw beef. Otherwise, a general trend was seen towards decreasing yield and sensory quality during frozen storage. A number of significant interactions between variables was obtained, suggesting that their influence on quality and yield is interrelated in a rather complex manner. IFT

55

The frequency and temperature dependence of dielectric food data as determined by a cavity perturbation technique.
Ohlsson, T.; Bengtsson, N. E.; Risman, P. O.
Journal of Microwave Power 9 (2) 129-145 (1974) [14 ref. En] [Swedish Inst. for Food Preservation Res. (SIK) Fack, S-400 21 Göteborg, Sweden]

Details are given of studies on the frequency and temp. dependence of the dielectric characteristics (ε_r' and ε_r'') of moist foods. Tables of values are given for ε_r' and ε_r'' of raw lean beef, raw fat beef, cooked beef, cooked codfish, raw potato, cooked potato, mashed potato (formulated), gravy (containing alginate stabilizer), distilled water and 0.1M NaCl solution, measured at frequencies of 450 and 900 MHz and at temp. of -20, -10, -5, +3, +20, +40 and +60°C. The effects of frequency, temp., thawing and composition (moisture and NaCl content) on ε_r', ε_r'' and penetration depth are discussed, together with practical significance for microwave heating performance. Results agreed well with literature data. [See also FSTA (1972) 4 3A136.] AJDW

56

Radiation leakage control of industrial microwave power devices.
Elder, R. L.; Eure, J. A.; Nicolls, J. W.
Journal of Microwave Power 9 (2) 51-61 (1974) [23 ref. En] [Bureau of Radiological Health, FDA, Dept. of Health, Education & Welfare, Rockville, Md, 20852, USA]

The safety of industrial microwave-heating equipment (including food processing equipment) is discussed, with special reference to legislation in the USA. Aspects covered include the Radiation Health and Safety Act of 1968, performance and safety standards, recommended fatty precautions, public health significance, and responsibilities of the manufacturer and the industrial user. Data are given for the magnitude and source of max. radiation leakage from various industrial microwave-heating systems, including food processing research units and equipment for finish-drying of potato chips, opening of oysters, precooking of chicken, precooking of onion ringe, rapid heating of school lunches, proofing of doughnuts and drying of macaroni. AJDW

57

An annotated bibliography on microwaves, their properties, production, and applications to food processing. [Book]
Goldblith, S. A.; Decareau, R. V.
xi+356pp. ISBN 0 262 07049 9 (1973) [En] Cambridge, Massachusetts, USA; MIT Press. Price £6.75 [Massachusetts Inst. of Tech., USA]

This annotated bibliography covers more than 600 articles (including patents), the abstracts being cross-indexed by author and by subject and arranged alphabetically under the following headings: Books review articles and announcements (pp. 1-39); Biological effects of microwaves, personnel safety, measurement of low doses, etc. (pp. 43-75); Dielectric properties of foods and biological materials and their measurement (pp. 79-115); Microwave equipment - power sources, ovens, wave guides, tunnels, etc. (pp. 119-168); Applications of microwaves for the following purposes: baking and milling (pp. 171-182); blanching and enzyme inactivation (pp. 183-191); cooking (pp. 192-214); defrosting of frozen foods (pp. 215-229); dehydration (pp. 230-242); food service, vending, and catering (pp. 243-253); freeze dehydration (pp. 254-266); insect control (pp. 267-268); nutritional effects of microwaves (pp. 269-277); packaging for microwave processing (pp. 278-283); potato chip finish drying (pp. 284-288); poultry precooking (pp. 289-293); precooked bacon and meat processing (pp. 294-301); processing - general and miscellaneous (pp. 302-317); and sterilization and pasteurization (pp. 318-336). VJG

58

[Application of freeze-drying to foods.] [Lecture]
Simatos, D.
Scienza e Tecnologia degli Alimenti 2 (1) 21-26 (1972) [21 ref. It, en] [Istituto di Biologia Applicata alla Nutrizione e alla Alimentazione, Univ. di Digione, Italy]

The subject is reviewed under the headings: physical basis of the process, apparatus, detn. of optimum pressure, circulation of incondensable gas, ventilation of product, heating by microwaves, biological and organoleptic quality of product, effect of technological conditions, and effect of properties of raw materials and their subsequent treatment. HBr

59

Abstracts of papers presented at the 62nd Annual Meeting of the Poultry Science Association, Inc. United States of America, Poultry Science Association
Poultry Science 52 (5) 1993-2106 (1973) [En]

Abstracts include: Feeding roasted corn to broilers, roasters and laying hens, by R. L. Adams (p. 1993); Factors affecting costs of egg production, by R. H. Adolph (pp. 1993-1994); Egg size and exterior quality changes in relation to clutch position and time of lay, by D. K. Andrews (p. 1995); Limited time feeding of commercial White Leghorn hens - a field trial, by D. K. Andrews (p. 1995); Evaluation of egg shells as a low cost Ca source for laying hens, by V. Arvat & S. W. Hinners (p. 1996); The role of the oviduct in the determination of egg quality, by R. E. Austic (p. 1997); Some observations on the processing and

organoleptic characteristics of scaleless chicken fowl, by D. E. Bigbee & M. Rubin (pp. 1998); Survival of Clostridium perfringens on chicken pieces cooked with microwave energy, by J. Blanco, L. E. Dawson & K. E. Stevenson (p. 1999); Performance of fresh and aged hot cut broiler meat in chicken rolls, by L. C. Boyd & H. R. Ball, Jr. (pp. 2000-2002); Evaluation of furazolium chloride in an egg-dipping solution, by A. C. Braemer & T. Hebert (p. 2001); The adaptivity of layers to methionine imbalanced corn-soya diets, by D. J. Bray (p. 2002).
AA

60

[Dielectric properties of starch in the microwave range as a basis for moisture determination.] Die dielektrischen Eigenschaften der Stärke im Mikrowellenbereich als Grundlage für die Feuchtigkeitsbestimmung.
Mladek, J.; Komarek, K.
Stärke **26** (5) 160-164 (1974) [13 ref. De, en, fr] [Forschungsinst. der Lebensmittelind., Trebohosticka 12, 100 00 Praha 10, CSSR]

The change of dielectric properties of starch with change of water content was utilized for continuous detn. of humidity. A balance method was applied to measure attenuation and phase shift of the electromagnetic wave permeating the material. The 10 GHz-microwave was generated by means of a reflex klystron. With increasing humidity there was an increase of electric loss. At the same time, the attenuation of the increasing electromagnetic wave in the starch made it possible to find the transitions between free and bound water of capillarity. By using a correction control circuit an accuracy in measurement of 0.3% absolute was reached. AS

61

[Method of obtaining an edible protein substance from small marine crustaceans.]
Kirpichnikov, V. P.; Nektrutman, S. V.; Sumenkov, B. I. (**Union of Soviet Socialist Republics,** Moskovskii Institut Narodnogo Khozyaistva im. G. V. Plekhanova)
USSR Patent 426 648 (1974) [Ru]

Crustaceans, e.g. krill, are comminuted and pressed, then the resultant liquid is heated to coagulate the protein, which is separated off. In order to provide more complete extraction of the liquid, to reduce chitin content and to accelerate the process, the comminuted mass is treated with an electromagnetic field of high or super-high frequency, e.g. 2375-2450 MHz, preferably at ≤36-40°C. W&Co

62

Vitamin B_6 in turkey breast muscle cooked in microwave and conventional ovens.
Bowers, J. A.; Fryer, B. A.; Engler, P. P.
Poultry Science **53** (2) 844-846 (1974) [5 ref. En] [Dept. of Foods & Nutr., Kansas St. Univ., Manhattan 66506, USA]

Turkey breast muscle portions were heated to internal temp. of 75 or 85°C in microwave or conventional electric ovens. Cooking time, cooking loss, moisture content and vitamin B_6 content were determined. Microwave cooking resulted in reduced cooking time and moisture content and higher cooking loss than cooking in a conventional oven. Although the samples cooked in the microwave oven contained more vitamin B_6 calculated on a cooked wt. basis, differences were not significant when calculated on a dry wt. basis.
AS

63

[Properties required of packs for frozen and deep-frozen products.] [Lecture]
Gac, A.
Revue Generale du Froid **65** (5) 481-485 (1974) [10 ref. Fr] [CTGREF 92160-Antony, France]

The properties required of packaging materials for frozen foods are discussed, and cover mechanical protection, impermeability to water vapour and gases (especially O_2), chemical and organoleptic inertness, tight application to the product to prevent ice formation inside the package, and low heat absorption. The importance of an uninterrrupted cold chain from producer to consumer is emphasized. Al trays are suitable for direct heating of frozen foods in conventional ovens, but new packaging materials are required for direct high-frequency or micro-wave heating, e.g. in institution kitchens. RM

64

[Effect of microwaves on the bacterial counts of starch.]
Yanai, S.; Yamada, Y.; Kimura, S.
Journal of the Japanese Society of Starch Science [Denpun Kogyo Gakkaishi] **19** (4) 192-194 (1972 (publ. 1973)) [10 ref. Ja, en] [Nat. Food Res. Inst., Koto-ku, Tokyo, Japan]

(i) Potato starch and (ii) sweet potato starch (containing 17.7, 16.5% moisture and 5.6×10^2, 2.4×10^3/g bacteria, respectively were irradiated in a microwave oven (Sharp Milro-range, frequency 2450 MHz, output energy 0.6 kW, the turnable system) for 30-180 s. After 180 s the bacterial counts of (i) and (ii) were decreased to 62.5 and 24.3% of the original counts, respectively. When moisture content of (ii) was increased to 26%, the sterilizing effect was higher, showing the bacterial counts of 11%, but some gelatinization occurred after 2 min. The microwave treatment was about 10 times as rapid as simple dry heating to attain similar effects. From experiments with resistant thermophilic bacteria isolated from the treated starches, the difference in the effect of microwave heating on (i) and (ii) was attributed to the different microflora present. SKa

65

Effect of broiling, grill frying and microwave cooking on moisture, some lipid components and total fatty acids of ground beef.
Janicki, L. J.; Appledorf, H.
Journal of Food Science **39** (4) 715-717 (1974)
[20 ref. En] [Food Sci. Dept., Univ. of Florida, IFAS, Gainesville, 32611, USA]

Raw and cooked ground beef patties were analysed for moisture, crude fat, total cholesterol and total fatty acid content. Patties were cooked by broiling, grill frying and microwave radiation (2450 MHz). In addition, broiled and frozen patties were reheated by microwaves and analysed. Compositional differences between patties prepared by broiling and grill frying were not significant. Patties processed by microwaves were lower in moisture and crude fat as compared to those prepared by other methods. All cooking treatments except microwave decreased cholesterol content significantly compared to raw patties; however, differences between treatments were not significant. Loss of cholesterol was proportionately less than the decrease in crude fat. 16 fatty acids were identified in total lipid extract. Fatty acids C14, C16, C16:1, C18:1 and C18:2 accounted for approx. 94% of total acid measured. Significant % composition changes occurred in C16, C18:1 and C18:2 fatty acids as a result of cooking methods. C16 acid underwent greatest % loss during cooking and was further reduced in microwave reheated precooked patties. % of C18:1 and C18:2 acids increased following all treatments. Ratio of unsaturated/saturated fatty acids was increased by all cooking methods, with greatest increase in precooked microwave reheated patties. IFT

66

[Use of microwave ovens in meat testing laboratories.]
Veenhof, J.
Voedingsmiddelentechnologie **7** (19) 8-9 (1974)
[4 ref. Nl] [Slachthuis, 's-Hertogenbosch, Netherlands]

Use of microwave ovens for cooking of samples of meat for evaluation of abnormal odour or flavour is discussed with reference to legislation and causes of abnormal flavour in meat (sex, feed effects, drugs, diseases, absorption of extraneous flavours or odours after slaughter). Studies on approx. 900 samples have shown that the microwave cooking method gives identical results to the conventional boiling and roasting methods. Advantages claimed for microwave cooking include uniformity and repeatability of cooking conditions, reduced time and labour requirements, minimization of uptake of extraneous odours from cooking utensils or added fat, and rapid evaluation of frozen meat samples. AJDW

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H. BROOKES

ASSISTANT EDITOR

1

Frozen convenience foods work 'miracle' at Mercy hospital.
Finnegan, T.
Quick Frozen Foods **36** (8) 26-29 (1974) [En]

A description is given of the food service system used at the 413 bed Mercy Hospital, in Buffalo, New York, which combines the use of frozen convenience foods, microwave cookery and a Differential Heating Container. Advantages noted are: 90% reduction in patient complaints about cold, tasteless foods; improvement in quality and preparation of foods; reduction in labour force; savings of 40% in preparation equipment purchases; and kitchen area occupies less space. VJG

2

Award-winning hospital menu offers 31 entrees based on frozen foods.
Ross, V.
Quick Frozen Foods **36** (10) 51-53 (1974) [En]

The Chilton Memorial Hospital, in Pompton Plains, New Jersey offers a combined luncheon and dinner menu with 10 appetizers and 31 entrees (including 5 salad plates, 6 cold and 4 hot sandwiches and 16 hot specialities) and a breakfast menu which lists 11 fruits and juices, 16 cereals, 4 breakfast breads and 11 substantial entrees. The menu, from appetizer to dessert, is based on frozen products. Modifications of the regular menu are available for patients on soft, bland and other restricted diets. All raw materials are purchased fresh, cooked on the premises and then wrapped and frozen. The meals which are heated in microwave ovens, are assembled on trays decorated with bright yellow tray-mats. Dishes and utensils are disposable but trays are permanent and washable. VJG

3

[Aróma retention in tropical fruit powders obtained in a vacuum microwave oven.]
Huet, R.
Fruits **29** (5) 399-405 (1974) [13 ref. Fr, de, en, es, ru] [IFAC-GERDAT, Lab. de Biochimie Appliquee Fac. des. Sci. et tech. du Languedoc, 34060 Montpelier Cedex, France]

A vacuum microwave oven was used for drying pineapple and passion fruit juice and banana paste. In order to produce a stable foam with small diam. bubbles suitable for drying at 45°C and 6-8 torr, raw materials were thickened by addition of sucrose and malto-dextrins to 59°Brix in the following proportions: pineapple juice - 1 kg sucrose + 0.1 kg maltodextrin/kg; banana paste - 0.8 kg sucrose + 0.2 kg maltodextrin + 0.005 kg sodium pyrosulphite/kg; passion fruit juice - 1 kg sucrose/kg. % Retention of total volatiles was 57 for pasteurized, 68 for fresh pineapple juice and 82 for passion fruit juice, compared to 33.1 for freeze-dried and 11.0 for spray dried passion fruit juice. The high retention of volatile odour components is attributed to their slow diffusion in conc. solution. The degree of retention is directly related to the molecular size. Although total retention of any component increased with concn.; the % retention decreased (e.g. % retention of isoamyl acetate fell from 48 to 15.5 as its GLC peak area increased from 1500 to 7000 mm^2). The quality of the product obtained under the mild conditions justifies the high processing costs. RM

4

Drying time cut up to 90%, energy use in half.
Anon.
Food Processing **35** (9) 25-26 (1974) [En]

Macaroni drying time has been reduced from 10 h to 36 min at Golden Grain Macaroni Co., San Leandro, California, by the use of microwave drying between 2 conventional drying stages. The flavour of pasta products dried by this method is as good as that of conventionally dried products; the colour is richer, because the products are heated from the inside out and thus have no tendency to bleach. AA

5

Dielectric properties of food materials.
To, E. C.; Mudgett, R. E.; Wang, D. I. C.; Goldblith, S. A.; Decareau, R. V.
Journal of Microwave Power **9** (4) 303-315 (1974) [13 ref. En] [Dept. of Nutr. & Food Sci., Massachusetts Inst. of Tech., Cambridge, Massachusetts 02139, USA]

The factors which affect the dielectric response of food materials are examined in an attempt to establish a predictive model and to obtain a more basic understanding of dielectric properties. Detailed dielectric measurements were performed on rehydrated dried skim-milk using the precision slotted line technique, at temp. of 25, 35, 45, and 55°C and at frequencies of 300, 1000, and 300 MHz. Solute-solute and solute-solvent interaction were found to reduce the dielectric loss factors to levels substantially below those predicted by chemical composition alone; therefore, the dielectric loss cannot be predicted from a linear, additive model based on composition. The results of dielectric measurements of solid food products, beef and turkey were reported. Conductivities of beef juice obtained from cooking were measured and the dielectric losses at 5 to 65°C and 300, 915, and 2450 MHz calculated based on the measured conductivities. AS

6

Quick and easy meals.
Anon.
Food Industries of South Africa **26** (13) 11 (1974) [En]

Advantages of microwave cooking and misapprehensions regarding microwave safety are discussed. Microwave ovens in the Litton range (7 models including the latest - Menumaster) are considered. VJG

7

Stoves - from ranges to microwave cookers.
English, M.
Food Industries of South Africa **26** (11) 28-29 (1974) [En]

Descriptions are given of various types of stoves, including ranges, ovens, boiling tops, griddles, high speed fryers, broilers, steamers, and microwave cookers, manufactured by the following companies: Garland, Defy, Blodgett, Frymaster and Neff. VJG

8

Starch gelation as a function of water content.
Collison, R.; Chilton, W. G.
Journal of Food Technology **9** (3) 309-315 (1974) [8 ref. En] [Dept. of Catering Studies, The Polytechnic, Queensgate, Huddersfield HD1 3DH, UK]

A dye staining method was used to determine the proportion of starch granules which are damaged as a function of initial water content during microwave heating or baking in a forced-air-convection oven. Although the granules were damaged much more rapidly on microwave heating, it was found that the proportion of damaged granules depended on the amount of water in the sample rather than on the method of heating. Samples of potato starch containing up to 30% water suffered no measurable damage. Beyond this point, damage increased with increasing moisture content, and all the granules were damaged provided the samples contained initially ≥55% water. AS

9

Egg processing with microwave energy.
Scharfman, H. (Raytheon Co.)
United States Patent 3 830 945 (1974) [En]

A method of and means for cooking and sterilizing eggs involves application of microwave energy at >140°F to complete a precooking stage of 110°F. IFT

10

Effects on bovine 1. dorsi muscle of conventional and microwave heating.
Roberts, P. C. B.; Lawrie, R. A.
Journal of Food Technology **9** (3) 345-356 (1974) [13 ref. En] [Bovril Ltd., Res. & Development Lab., Wellington Road, Burton-on-Trent, Staffs, UK]

A sequence of adjacent samples of beef 1. dorsi muscle were alternately exposed either to conventional heating for 0-70 min at temp. between 45-90°C or to microwaves at a frequency of 2450 MHz for 0-10 sec at power levels between 131 and 1050 W. Protein denaturation was assessed by measuring N distribution between sarcoplasmic and crude myofibrillar fractions and by electrophoresis; and concomitant superficial changes in free water and plasticity measured. The attainment of a given temp. by microwave energy was associated with less detrimental change than by conventional heating; but this could be attributed merely to further progression of the same type of effects due to the time factor and not to any qualitative difference. The findings suggest that microwave heating might permit microbial inactivation in meat products with min. loss of organoleptic quality. It is also suggested that the observed initial resistance of myoglobin to heat denaturation and its subsequent loss of electrophoretic mobility between 75-88°C could be developed as an index of the temp. attained by meat products. AS

11

[Plastics container for food products.]
Hoechst Holland NV
Netherlands Patent Application 7 217 323 (1974) [Nl]

A container for deep-frozen instant meals etc., which are prepared for consumption (e.g. in canteens, restaurants, hospitals) by heating in a magnetron oven consists of an insulating base of foamed material (preferably polystyrene), an inner cut-resistant layer (preferably polystyrene film) glued or thermally attached to the foam layer and is covered by foil (preferably a polyester or polyester-ethylene film coated with a wax layer which at 75-80°C provides satisfactory adhesion and permits easy removal of the cover). W&Co

12

[Method for continuous pasteurization of beer and similar beverages containing carbon dioxide.]
Kadaner, Ya. D.; Ananin, I. A. (**Union of Soviet Socialist Republics**, Vsesoyuznyi Nauchno-issledovatel'skii Institut Pivobezalkogol'noi promyshlennosti)
USSR Patent 446 544 (1974) [Ru]

To improve shelf-life without loss of quality, a liquid flow is treated with an electromagnetic field of 2375 ± 25 MHz frequency at 4-6 atm and 60-70°C for 3-12 S in a 1-7 cm thick layer. W&Co

13

Continuous pasteurization of bottled fruit juices by high frequency energy. [Conference proceedings]
Demeczky, M.
IV International Congress of Food Science and Technology **5a**, 3-5 (1974) [En] [Central Food Res. Inst., Budapest, Hungary]

A continuous high-frequency pasteurization method and the pertinent apparatus was developed

for mild and economic heat treatment of fibrous or clear fresh fruit and vegetable juices in glass or polypropylene bottles (13.56 MHz, 1-10 kW/l. power density, max. energy requirement 0.2 kWh/l.). Products scored significantly higher flavour values than after traditional pasteurization, while ascorbic acid and viable cell count was not significantly different. The wt. of the equipment is 1/20, vol. 1/5 and operating costs 60% of traditional pasteurization. RM

14

[Effect of microwaves on the bacterial counts of starch.]
Yanai, S.; Yamada, Y.; Kimura, S.
Journal of the Japanese Society of Starch Science [Denpun Kogyo Gakkaishi] **19** (4) 192-194 (1972) [10 ref. Ja, en] [Nat. Food Res. Inst., Min. of Agric. & Forestry, Tokyo, Japan]

Microwave treatment of starch for 3 min reduced the viable bacterial count of the starch samples by 37-75%. When the moisture content of starch was increased from 16.5% to 26%, the disinfection effect of microwaves was enhanced, although partial gelatinization of the starch occurred after 2 min. The resistance of thermophiles isolated from starch samples was tested in water with microwave treatment. The susceptibility of the isolates to the microwave treatment was similar to that of heat treatment; however survival was greater with the latter than the former. AS

15

Continuous high frequency dielectric equipment and technology for baking bread.
Runtag, T.
Acta Alimentaria Academiae Scientiarum Hungaricae **3** (4) 349-356 (1974) [11 ref. En] [Central Food Res. Inst., H-1022 Budapest, Herman Otto ut 15, Hungary]

Laboratory experiments were carried out to determine conditions for large-scale production of bread using high frequency dielectric equipment; solve problems of crust formation; and collect data on economic parameters. Using half-brown bread dough prepared from wheat flour BL 80 and rye flour RL 90, the first stage of baking involved heating the leavened dough to 80-85°C in the high frequency field, and the last stage, including crust formation, in a traditional oven. The baking equipment is described and illustrated. Data indicate that slight savings in materials and production costs could be achieved when using this combined method for large-scale production. AL

16

A comparison of the flavour of beef cooked conventionally and by microwave radiation.
[Conference proceedings]
MacLeod, G.; Coppock, B. M.
IV International Congress of Food Science and Technology **1a**, 1-3 (1974) [En] [Dept. of Food Sci. & Nutr., Queen Elizabeth Coll., Campden Hill Road, London W8 7AH, UK]

Using an extraction procedure, low temp. vacuum distillation, gas chromatography and MS, the aroma volatiles have been isolated, separated and major components identified during cooking of beef by microwave radiation and by conventional means, for different time periods and in the presence or absence of water. Odour assessments and sensory properties of the beef were compared with the instrumental methods and differences resulting from cooking procedures are discussed. ELC

17

[Dielectric characteristics of cereal products manufactured from dough prepared using chemical raising agents.]
Selyagin, V. E.
Izvestiya Vysshikh Uchebnykh Zavedenii, Pishchevaya Tekhnologiya No. 3, 40-42 (1974) [4 ref. Ru] [Vses. Zaochnyi Inst. Pishchevoi Promyshlennosti, USSR]

Dielectrical characteristics of bread dough prepared using chemical rising agents were studied. The dough was produced from wheat flour, salt, baking soda, potassium hydrogen tartrate and water. The relative dielectric permeability of the dough and the tangent of the angle of dielectric loss served as indicator. Knowledge of the dielectric characteristics of the dough enables the dough heating conditions to be established, as well as its optimal density and the technical and economic parameters of high frequency baking ovens. STI

18

Survival of Clostridium perfringens on chicken cooked with microwave energy.
Blanco, J. F.; Dawson, L. E.
Poultry Science **53** (5) 1823-1830 (1974) [22 ref. En] [Dept. of Food Sci. & Human Nutr., Michigan St. Univ., East Lansing, Michigan 48824, USA]

Chicken pieces, which had been inoculated with spores or vegetative cells of heat resistant or heat sensitive strains of Clostridium perfringens, were cooked in a microwave oven and browned in corn oil. The effects of freezing, thawing and frozen storage before and after microwave cooking on recovery of vegetative cells and spores were evaluated. Microwave cooking resulted in a two log cycle reduction in resident vegetative and inoculated C. perfringens cells. When chicken pieces were frozen and thawed, prior to microwave cooking, a greater reduction of the microbial load after cooking was found for both cells and spores of C. perfringens. Reduction of spores by microwave energy was minimal, however, the cooking environment provided an efficient activation and germination step. Cells or spores of C. perfringens were not recovered after microwave cooking followed by browning in heated vegetable oil at 190.5°C. AS

19

[Microwave moisture detector.]
Kraszewski, A.
Industries Alimentaires et Agricoles **91** (11) 1403-1405 (1974) [Fr, en, de]

The principles and operation of a microwave moisture detector are explained. It can be used in drying or wetting process control, and has been applied to foods (Italian pasta, marzipan, milk powder, margarine manufacture). RM

20

Permittivity of some dairy products at 2450 MHz.
Rzepecka, M. A.; Pereira, R. R.
Journal of Microwave Power **9** (4) 277-288 (1974) [12 ref. En] [Dept. of Food Sci., Univ. of Manitoba, Winnipeg, Manitoba R3T 2N2, Canada]

The dielectric constant and loss of dried milk, dried whey and butter were measured at a frequency of 2.54 GHz. For both powders, the values of both components of the permittivity were found to vary linearly with the bulk density provided the moisture content was constant. The variation of the dielectric constant with moisture content could be explained in terms of Böttcher's formula, if it were assumed that water up to 3.3% was entirely bound water and the remainder free, but the agreement for the dielectric loss was less good. With butter, the critical water content was about 6%. JHP

21

Determination of the strength of water suspensions using a microwave bridge technique.
Kraszewski, A.
Journal of Microwave Power **9** (4) 295-302 (1974) [10 ref. En] [Wilmer Instruments & Measurements, Inst. of Physics, 00-108 Warsaw, Zielna 39, Poland]

Using Wiener's formula for the permittivity of a mixture, the attenuation of suspensions was shown theoretically to depend upon the sp. gr. of the suspended material and the concn. Experimental measurements at 9.4 GHz on evaporated and condensed milk and on some cement slurries gave results which agreed well with prediction up to quite high concn. It is suggested that the method opens up possibilities for production control. JHP

22

A comparison of the weight loss, tenderness, and nutrient retention of selected meat products cooked uncovered and in oven film.
McMullen, E. A.
Dissertation Abstracts International, B **35** (4) 1779: Order No. 74-22024 (1974) [En] [North Carolina Univ., Greensboro, North Carolina, USA]

The effect of roasting by (i) conventional (electric, gas) or (ii) electronic (microwave) heating on the wt. loss, thiamin and riboflavin retention, and shear force values of retail cuts of turkey, beef and pork, cooked uncovered or in oven foil, was studied. It was found that: (i) was 5 times slower than (ii) losses were greater for wrapped meat in (i) and unwrapped meat in (ii); the greatest wt. loss was with unwrapped pork in (ii); thiamin and riboflavin retention did not vary significantly with any method, but thiamin retention was highest in pork; and shear force values were lowest in wrapped meats in (ii) and differed according to the position from which cores were taken. AL

23

Precooked sliced bacon.
Jeppson, M. R.
British Patent 1 371 817 (1974) [En]

Process for precooking sliced bacon and other meat products employs microwave ovens and steam pre-heating of the product to minimize the amount of microwave energy employed. IFT

24

Destruction of Escherichia coli and Salmonella typhimurium in microwave-cooked soups.
Culkin, K. A.; Fung, D. Y. C.
Journal of Milk and Food Technology **38** (1) 8-15 (1975) [16 ref. En] [Dept. of Microbiol., Pennsylvania St. Univ., University Park, Pennsylvania 16802, USA]

Single serving (i.e. 200 ml) portions of tomato soup, vegetable soup, and broth inoculated with Escherichia coli or Salmonella typhimurium at about 10^7 organisms/ml were exposed to 915 MHz microwaves. After various timed exposures the temp. of the top, middle, and bottom regions as indicated by changes in previously positioned assemblies of temp. sensitive paper strips were noted and aliquots were removed from the same regions for standard plate count determination of survivors. For any given exposure time, the temp. of the middle region was warmest, the bottom intermediate, and the top coolest. Despite the relative temp. of the regions, however, the consistent finding was that, for any exposure time, the closer the samples organisms were to the top the lower their level of survival. In terms of temp., it was noted that organisms in the top had declined to a given level of survival at a temp. lower than the temp. corresponding to the same survival level in the middle or bottom soup regions. These data suggest that heat generated during microwave exposure alone is inadequate to fully account for the nature of lethal effects of microwaves for microorganisms. AS

25

[Dielectric heating in food processing. Measurement of the dielectric properties of foods, and studies on thawing and pasteurization.]
Bengtsson, N.
SIK Rapport No. 284, 57pp. (1971) [29 ref. Sv, en] [Swedish Inst. for Food Preservation Res. (SIK), Fack, 400 21, Göteborg 16, Sweden]

Details are given of an extensive series of studies on microwave heating of foods. Aspects studied include: measurement of the dielectric characteristics of frozen and thawed meat and fish in the frequency range 10-200 MHz; the dielectric properties of foods at 3GHz; methods for measurement of temp. changes in foods during microwave heating (IR television, thermocouple measurements, liquid-in-glass thermometers, mp indicators); dielectric thawing of frozen meat and fish; and dielectric heating of cured ham. AJDW

26

Fish muscle in the frozen state: time dependence of its microwave dielectric properties.
Kent, M.
Journal of Food Technology **10** (1) 91-102 (1975) [12 ref. En] [Torry Res. Sta., 135 Abbey Road, Aberdeen, AB9 8DG, UK]

Microwave attenuation properties of frozen cod muscle exhibit a time dependence, falling in value over periods of 1-3 wk. This reduction of attenuation is due to gradual accretion of ice in the frozen system at the expense of unfrozen water. More than 1 exponential component is observed in the overall change and at least 2 are seen. These are both thermally activated and the activation energies for the characteristic time constants lie in the range 32-49 kJ mol^{-1}. This is similar in value to activation energies for diffusion through dehydrated and frozen systems. An explanation is offered which takes this into account. AS

27

[Method of drying food materials, in particular materials of vegetable origin.]
Sepitka, A.; Vasicova-Kostolanska, J.; Grodovsky, M.; Burak, S.
Czechoslovak Patent 158 338 (1974) [Cs]

The material is first treated by microwave heating and dried in ventilated layers. STI

28

The microwave sterilization of water.
Stack, D. B.
Dissertation Abstracts International, B **35** (7) 3332-3333: Order no. 75-237 (1975) [En] [Wyoming Univ., Laramie, Wyoming, USA]

Results of microwave sterilization of water were compared with those obtained by concentional thermal methods, using 200 ml samples of sterile distilled water inoculated with aliquots of Escherichia coli solution and exposing them to the energy source for various times. The time constant for thermal denaturation was 667 s and for microwave denaturation 107 s. The microwave method resulted in 38% savings in energy. AL

29

Improvements in the cooking of food products.
Spooner Food Machinery Engineering Co. Ltd.,
British Patent 1 376 744 (1974) [En]

To reduce the time required to bake bread, some, but not all, of the heat is supplied by microwaves, used particularly to replace part of the convective heating. A description of the equipment involved is given. HBr

30

Tenderness of beef roasts.
Ream, E. E.; Wilcox, E. B.; Taylor, F. G.; Bennett, J. A.
Journal of the American Dietetic Association **65** (2) 155-160 (1974) [19 ref. En] [Dept. of Nutr. & Food Sci., Utah St. Univ., Logan, Utah, USA]

Investigations were carried out into the dry roasting of large (8-9 lb) and small (approx. 3 lb) beef roasts in conventional electric and microwave ovens. Large roasts were also cooked by top-of-the-stove moist heat and moist heat in the microwave oven. Method of cooking showed a significant influence on juiciness, tenderness and flavour as judged by shear force, drip and taste panel. Taste panel evaluation showed beef cooked in the microwave oven to be less tender, juicy and flavourful and had higher cooking losses than conventionally cooked meat. Chemical tests run on the small roasts for lipid, Fe, Mg, Zn, Na, K and P showed negative correlations of tenderness with higher Fe, Mg, P, K contents of the muscle, positive correlation with high Na content, and no relation with Zn. An increase in percentage of lipids was positively correlated with low Fe and K content and high Na. Tenderness increased with increasing lipid content and with the age of the animal. VJG

31

Dielectric food data for microwave sterilization processing.
Ohlsson, T.; Bengtsson, N. E.
Journal of Microwave Power **10** (1) 93-108 (1975) [16 ref. En] [Swedish Inst. for Food Preservation Res., SIK, Fack, 400 21 Göteborg 16, Sweden]

The dielectric constant and loss factor of various foods (including meat, fish, vegetables and commercially-prepared products) were determined at microwave frequencies of 450, 900 and 2800 MHz at temp. of 40-140°C. Tables of results are given. Effects of composition, temp. and microwave frequency on the dielectric properties of foods are discussed, and computer simulation studies on microwave sterilization of foods are described. AJDW

32

Microwave bean roaster.
Hamid, M. A. K.; Mostowy, N. J.; Bhartia, P.
Journal of Microwave Power **10** (1) 109-114 (1975) [6 ref. En] [Dept. of Electrical Eng., Univ. of Manitoba, Winnipeg, Manitoba, Canada]

An experimental microwave heating unit for roasting of seeds (e.g. soybeans, rapeseed, coffee beans, sunflower seed, pumpkin seeds, sesame seeds, peanuts, etc.) is described. Applications include destruction of any insects present, and inactivation of enzymes or enzyme inhibitors. Data is given for studies on inactivation of trypsin inhibitor in soybeans; total inactivation was achieved by microwave heating for 3 min to a final temp. of 153°C. Energy consumption was approx. 66% that required by conventional processes. AJDW

33

Effect of 2450 MHz microwave radiation on horseradish peroxidase.
Henderson, H. M.; Hergenroeder, K.; Stuchly, S. S.
Journal of Microwave Power **10** (1) 27-35 (1975) [24 ref. En] [Dept. of Food Sci., Univ. of Manitoba, Winnipeg, Manitoba R3T 2N2, Canada]

Effects of microwave irradiation (2450 MHz) at power densities of 62.5-375 W/cm^3 for 5, 10, 20, 30 or 40 min at approx. 25°C on the activity of horseradish peroxidase were studied; the results show that peroxidase activity can be reduced by >99%, but very high microwave power densities were required. The results are discussed in relation to the possibility of microwave-blanching of fruit and vegetables. AJDW

34

[Use of microwaves for blanching peaches.]
Avisse, C.; Varorvaux, P.; Dupuy, P.
Comptes Rendus des Seances de l'Academie d'Agriculture de France **60** (10) 741-748 (1974) [16 ref. Fr] [Sta. de Tech. des Produits Vegetaux INRA, 7, rue Sully BV 1540, 21034 Dijon Cedex, France]

1500-1700 g/lots (9 peaches diam. 5, 6 and 6.6 cm of var. Ambergen, Babygold 6, Dixon and Tuscan, were treated with microwaves for 0, 6, 8 and 10 min (1 min periods with 1 min intervals) at 6.3 cal/g/min. After this treatment, fruits were halved, destoned, frozen in liquid N, stored for 1 month at -18°C and allowed to thaw at ambient temp. (22°C) for enzyme and physical studies, and thawed by microwaves for organoleptic studies. Considerable temp. differences were found between surface and centre portions of fruits, with 40-50°C at the surface and 60-90°C at the centre. This caused rupture of some fruits and could be

35

Time domain measurements of the dielectric properties of frozen fish.
Kent, M.
Journal of Microwave Power **10** (1) 37-48 (1975) [18 ref. En] [Torry Res. Sta., 135 Abbey Road, Aberdeen, Scotland AB9 8DG, UK]

Studies on the effects of microwave frequency, temp. and storage time on the dielectric properties (permittivity, loss tanget spectrum, conductivity) of frozen minced cod are described. Graphs of results are given. Significant changes in the dielectric properties of cod meat during storage were observed; these change are attributed to slow changes in the internal partition of ice and water within the muscle tissue. AJDW

36

[Instant heating at the core of food products. Microwaves.]
Meisel, N.
Industries Alimentaires et Agricoles **91** (9/10) 1203-1214 (1974) [Fr, de, en]

The principles of microwave heating are explained and its applications in industrial processes illustrated by examples, e.g. thawing, cooking, vacuum dehydration. Cost analysis indicates that for industrial uses products should be treated at the threshhold thawing barrier. RM

37

Advent of microwave, UPC code spurs interest in FF packaging redesign.
Katz, A.
Quick Frozen Foods **36** (12) 22-24, 36 (1974) [En]

Description are given of new US frozen food packages. The new designs are influenced by recently promulgated government regulations for nutritional labelling, the grocery industry's desire to inaugurate the use of the universal product code and the necessity to provide appropriate cooking instructions for microwave oven owners. VJG

38

Vertical liquid nitrogen freezer permits centralized, automated patient feeding.
Chamberlain, R.
Quick Frozen Foods **37** (1) 28-30 (1974) [En]

A description is given of the patient food service system at the Eastern division of West Jersey Hospital. The hospital prepares and freezes the major portion of its hot food for its menus, storing it for future use. It is then retrieved and heated by an automatic, conveyorized, microwave-oven system. Advantages of the vertical freezer are lower cost, the freezer takes up small floor space and there is min. heat loss through the system's walls because of the ratio of system surface area to volume. VJG

39

Microwave baking.
Levinson, M. L.
United States Patent 3 881 027 (1975) [En]
In a method of baking a food in a microwave oven, a microwave-absorptive material absorbs and converts energy to heat energy to be used in baking. IFT

40

[The quality of canned peas.]
Varoquaux, P.; Auisse, C.; Nadal, N.; Cousin, R.
Industries Alimentaires et Agricoles **91** (11) 1415-1422 (1974) [25 ref. Fr, de, en] [Sta. de Tech. des Produits Vegetaux, 7 rue Sully, 21034, Dijon, France]
Objective quality criteria of pasteurized or quick-frozen peas and discussed. Tenderness (or moisture content), sugar content and colour are important criteria for consumer preference while size is not. These criteria allow the selection of the most suitable var. and harvesting date. Post-harvest changes (e.g. hexanal production through lipoxygenase action) are discussed with reference to fatty acid composition and blanching. Wrinkled pea var. have higher unsaturated fatty acid contents and higher lipoxygenase activity than smooth var. Microwave blanching may reduce loss of soluble matter of classical hot water or steam blanching but could cause dehydration and destruction of antioxidants. RM

41

Wet ashing of some biological samples [including bovine liver] in a microwave oven.
Abu-Samra, A.; Morris, J. S.; Koirtyohann, S. R.
Analytical Chemistry **47** (8) 1475-1477 (1975) [3 ref. En] [Environmental Trace Substances Res. Center, Univ. of Missouri, Columbia, Missouri 65201, USA]

42

Package into microwave oven, without removing tray, achieved in tests.
Martin, S.
Quick Frozen Foods **37** (4) 19-21, 59, 62, 69 (1974) [En]
A description is given of the developments which make it possible to place a frozen dinner or entree into any existing microwave oven and heat it perfectly in a relatively few min. By changing only the design of the outer package the food was purchased in, it is possible to heat in a microwave oven, frozen food packaged in an Al foil tray for gas and electric ovens. The metal foil tray is placed in a porous fibre tray, and a sheet of transparent plastic capable of resisting temp. approx. 400°F is sealed over the top. This novel packaging concept reduces the 20 min to 2 h cooking time required for Al tray products in conventional ovens to <15 min. VJG

43

The effect of heat treatments on the chlorophyll in green pepper.
Lee, K. L.; Park, J. R.; Lee, S. W.
Journal of the Korean Society of Food and Nutrition **3** (1) 13-16 (1974) [5 ref. En, ko] [Dept. of Food Nutr., Coll. of Home Economics, Yeungnam Univ., Daegu, S. Korea]
Green peppers were heated at 100°C for 5, 10, 15 min in boiling water, steam and hot air and for 1, 2, 3 min in a microwave oven. Chlorophyll content decreased with increase in heating time. Of the treatments, steaming had the greatest effect, then boiling water and finally hot air or microwave heating gave only a small change. KoSFoST

44

[Rapid estimation of TS content of milk using a microwave oven.] Untersuchungen zur Schnellbestimmung von Milchtrockenmasse mittels eines Mikrowellenherdes.
Marchart, H.; Hoffer, H.
Österreichische Milchwirtschaft **30** (8) 129-130, 133 (1975) [2 ref. De]
Microwave heating in a suitably-ventilated oven provides a more rapid drying procedure for whole and skim-milk than does normal oven drying. Under the conditions tested, about 99% of the moisture was removed in 6 min and practically all in 13 min. TS contents thus determined were, however, about 0.2% lower relatively than those obtained by drying for 0.5 h on a water bath followed by 2.5 h in an oven at 104 ± 2°C, presumably owing to absence of atmospheric oxidation. The method is unsuitable for use with dried milk, however, since removal of the last traces of moisture requires too prolonged an operation. GTP

45

Shellfish preservation.
Walker, E. L.; Ferrandini, A.
Canadian Patent 965 294 (1975) [En]
Fresh, cooked shellfish meat is pasteurized by means of microwave energy after treatment with aqueous solution of sodium chloride, antibacterial agents and strong organic acids. IFT

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H. BROOKES

ASSISTANT EDITOR

1

Quality of foods after cooking in 915 MHz and 2450 MHz microwave appliances using plastic film covers.
Armbruster, G.; Haefele, C.
Journal of Food Science **40** (4) 721-723 (1975) [7 ref. En] [Div. of Nutr. Sci., Cornell Univ., Ithaca, New York 14850, USA]

Foods were cooked in 915 MHz and 2450 MHz microwave appliances with and without Saran Wrap plastics film covers. Quality of cooked foods was evaluated by sensory methods, measurements of uniformity of doneness, cooking losses and vitamin content. Cooking times, convenience and hazards were also determined. Use of plastics film covers resulted in improved textural characteristics and more uniformity of doneness. Cooking times were also shorter. Temp. measurements in cooked foods revealed that film covers promoted faster heating and more even distribution of heat. No hazards were encountered when film was used. Few significant differences in cooking losses and vitamin content were observed. IFT

2

[Microwave heating of foods. Basic principles of process calculations.]
Ohlsson, T.
SIK Rapport No. 380, 76pp. (1975) [9 ref. Sv, en]

Studies on microwave heating of foods are described. Aspects studied include: the dielectric properties of meat, fish, gravy, potato and water at 450 and 900 MHz (over the temp. range -20 to +140°C) and at 2800 MHz (over the temp. range 40-140°C); a calculation method for correction of dielectric constants of foods with high loss factors; effects of moisture and salt contents on the dielectric properties of foods; computer programmes for calculation of temp. distribution in microwave heating; agreement between calculated and experimental data; and studies on microwave heating, thawing and sterilization of foods. AJDW

3

[Sterilizable bag for packaging food products.] Sterilisierfähiger Beutel zum Verpacken von Lebensmitteln.
Schwinn, G. (Scheuch KG)
German Federal Republic Patent Application 2 364 219 (1975) [De]

A package particularly intended for enclosing a ready-to-serve dish which is to be heated in a microwave oven, consists of an outer container of Al/plastics composite foil and an inner container of plastics material, both being heat sealed in the conventional manner but with no weld between the outer and inner containers. The packaged products can be kept for 1-2 yr without refrigeration. [See also following abstr.] W&Co

4

[Sterilizable bag for packaging food products and method of manufacture.] Sterilisierfähiger Beutel zum Verpacken von Lebensmitteln und Verfahren zu dessen Herstellung.
Schwinn, G. (Scheuch KG)
German Federal Republic Patent Application 2 364 220 (1975) [De]

In a modification [see preceding abstr.], the outer face of the inner container is heat sealed to the inner face of the outer container down two opposite sides of the packaging. This ensures that the top seal of the inner container is 5 cm from that of the outer container. Prior to heating in the microwave oven, the top of the outer container is cut off and this container is peeled from the inner container. W&Co

5

Advanced technology: innovating with microwaves.
Slater, L. E.
Food Engineering **47** (7) 51-53 (1975) [En] [Food Eng., Box 2035, Radnor, Pennsylvania 19089, USA]

A combined microwave-vacuum dehydration technique is described, using a conventional 15 ft long microwave processing tunnel adapted to operate at a vacuum of 1-15 torr and equipped with air lock systems for loading and unloading. The food concentrate or whole item is dropped through the air lock on to a continuous stainless steel belt and water is evaporated at 30°C without loss of aromas and flavour components. The dried foam is broken up by a turning scraper before the exit. The complete process takes 20-40 min to final product moisture <1%. Operating festures include an IR sensor in the tunnel which measures product surface temp. and controls belt and feeder speeds. Incoming material >60% solids content can be dried and sugar can be added to fruit concentrates. Apparent density of product foam <0.10 ensures excellent rehydration. Ionization of microwaves was prevented by increasing the frequency from 915 to 2450. Applications include herb extracts, fruit powders, and new products. Product quality resembles freeze-drying at lower cost. RM

6

Dielectric properties at microwave frequencies of agar gels. Similarity to the dielectric properties of water.
Roebuck, B. D.; Goldblith, S. A.
Journal of Food Science **40** (5) 899-902 (1975) [15 ref. En] [Dep. of Nutr. & Food Sci., Massachusetts Inst. of Tech., Cambridge, Massachusetts 02139, USA]

At 1.0 giga-Hz and 3.0 giga-Hz, the dielectric properties ($\varkappa'$ and $\varkappa''$) of agar gels were determined at 5, 25, 45 and 65°C for concn. as high as 3% agar. The dielectric constant $\varkappa'$ of the agar gels at all temp. studied was found to be similar to the $\varkappa'$ of water at the corresponding temp. and frequency. The dielectric loss $\varkappa''$ of the agar gels for the corresponding temp. and frequency showed max. deviation from $\varkappa''$ of water for the higher temp., the

higher agar concn., and the lower frequency. Agar gels, having dielectric properties similar to water yet rigid in form, can conveniently be used for preparing models of real foods for microwave oven experiments of thawing, cooking and processing of foods. IFT

7

Theory for and experiments with a TM_{02n} applicator.

Risman, P. O.; Ohlsson, T.

Journal of Microwave Power **10** (3) 271-280 (1975) [9 ref. En] [Husqvarna AB, S-561 01 Huskvarna, Sweden]

A novel type of cylindrical applicator using a TM_{02n} mode for microwave heating of pumpable materials in a tube is presented. A theoretical analysis of the field configuration in the load and the applicator is given. Using this applicator, zero field strength can be achieved at a given radial distance from the axis, preferably coinciding with the pipe wall so that no buildup of deposits or overheating of the product occurs at the tube wall. The central concentration of the radial power densi, was experimentally verified. Although the variations in the axial power distribution of the investigated cavities were significant, they could be improved by changing the coupling system. Computer programmes were developed for for the field calculations and for studies of the influence of different parameters on the heating performance. Among possible uses of the applicator are rapid heating of heat-sensitive fluids containing suspended solids and heating of viscous fluids as well as for extrusion cooking or coagulation of proteinous foods. AS

8

Microwave drying of microorganisms. I. Influence of the microwave energy and of the sample thickness on the drying of yeast.

Gomes, A. M. F.; Leonhardt, G. F.; Torloni, M.; Borzani, W.

Journal of Microwave Power **10** (3) 265-270 (1975) [3 ref. En] [Dept. of Chem. Eng., Escola de Engenharia Maua, C.P. 5657, Sao Paulo, Brazil]

A series of studies (using a Microvac-2000 1.2-4.2 kW microwave oven, operating at 2450 MHz) on microwave-drying of pressed yeast (Saccharomyces cerevisiae) is described. Variables studied were input power of the oven (1.2, 1.8, 2.4, 3.0, 3.6 or 4.2 kW), particle size of the pressed yeast (0.57, 1.42 or 2.68 mm diam.) and the thickness of the yeast sample (0.4-5.0 cm). Drying curves are given, together with a table showing the time taken to dry the samples to a final moisture content of 0.05 g/g yeast, and the acceptability of the dried product. Power input was linearly related to drying rate calculated during the constant rate period, irrespective of particle size. For samples >2 cm thick, there is no significant variation of drying rate with sample thickness. It is concluded that microwave drying may be a suitable technique for drying of microbial proteins. AJDW

9

Texture of broccoli and carrots cooked by microwave energy.

Schrumpf, E.; Charley, H.

Journal of Food Science **40** (5) 1025-1029 (1975) [15 ref. En] [Foods & Nutr. Dep., School of Home Economics, Oregon State Univ., Corvallis, Oregon 97331, USA]

This study verified and attempted to account for the effects of microwave cooking on the texture of vegetables. Cooking by microwaves vs. boiling produced a less tender, spongy outer cylinder and a more fibrous core in carrots. In broccoli, the outer layer was tough while the central portion was more tender than that cooked conventionally. Alteration of the pectic substances appears inadequate to account for the textural differences. Greater water loss, more shrunken contour of the vegetables, and more pronounced collapse of cells in tissues cooked by microwaves suggest that dehydration of the cell wall, possibly accompanied by increased crystallinity of the polysaccharide gels, may account for the greater toughness observed. IFT

10

Process for preparing dried, precooked starch products with microwaves.

Eastman, F.; Giacobello, B. J.; Rubens, R. W. (National Starch & Chemical Corp.)

United States Patent 3 904 429 (1975) [En]

In a process for the preparation of dried precooked starch products, a cooked paste of starch and water containing 25-80% solids is dried by application of microwave energy. IFT

11

Drying of pasta.

Fredrickson, C. (Microdry Corp.)

United States Patent 3 908 029 (1975) [En]

Moist pasta is heated with microwave energy to a temp. >175°F to partially dry it, after which it is cooled in an atmosphere of 75-100% RH and a temp. of 70-120°F, until the pasta has an internal temp. of <160°F. IFT

12

Influence of thawing and cooking procedures on selected characteristics of broilers.

Cunningham, F. E.; Lee, H. W.

Poultry Science **54** (3) 903-908 (1975) [22 ref. En] [Dairy & Poultry Sci. Dep., Kansas State Univ., Manhattan, Kansas 66506, USA]

Fresh broilers purchased from a local supermarket were halved, frozen at -29°C, and held frozen for 6 wk. Broiler halves were cooked either (i) from the frozen state or (ii) after thawing for 48 h at 4°C. They were deep fat fried, cooked by microwaves, pan fried or oven roasted. Wt. losses were significantly greater for (ii) than for (i). Microwave cooking and oven roasting resulted in lower st loss than deep-fat or pan frying. Taste panels could not distinguish between broilers cooked from the frozen state and those thawed before cooking. Shear press values did not differ significantly as a result of preparation or cooking

method. Total haem pigment concn. in flesh surrounding the femur of cooked broilers were determined. No significant difference was found between (i) and (ii), or among cooking methods. (i) had less bone darkening than (ii), and deep-fat frying and microwave cooking resulted in severer bone darkening than the other cooking methods. AS

13

Measuring electric field distribution in a microwave oven. [Lecture]
Ringle, E. C.; David, B. D.
Food Technology **29** (12) 46, 48, 50, 52-54 (1975) [14 ref. En] [Food Eng. Lab., US Army Natick Development Cent., Natick, Massachusetts 01760, USA]

This article describes the development of a procedure for measuring the electric field distribution in a microwave oven. Use of the browning reaction on a fibreglass matrix provided a 3-dimensional visualization of the energy distribution and a simple tangible method for evaluating oven performance. The electric field distribution was also quantified by extraction and spectrophotometric determination of the browning reaction products. IFT

14

Microwave heating. [Book]
Copson, D. A.
Ed. 2, xi + 615pp. (1975) [En] Westport, Connecticut, USA; AVI Publishing Co. Inc. Price $38 (USA) $39 (Foreign) [Dep. of Biol., Univ. of Puerto Rico, Mayaguez, Puerto Rico]

This book is intended for the scientific investigator using microwave heating, for the practical professional and for those interested in freeze-drying. Chapters included are: Theory of microwave heating (pp. 1-34, 54 ref.); Microwave freeze-drying - origin of the process (pp. 35-64, 35 ref.); Thermal history of the product in microwave freeze-drying (pp. 65-87, 29 ref.); Derivation of the theory of microwave freeze-drying (pp. 88-116, 23 ref.); Design and development of microwave freeze-driers (pp. 117-139, 9 ref.); Microwave transmission into the freeze-drier (pp. 140-168, 18 ref.); Vapour condensation (pp. 169-192, 16 ref.); Instrumentation and continuous processing (pp. 193-214, 24 ref.); Experimental freeze-drying (pp. 215-234, 41 ref.); Technology of microwave freeze-dried foods (pp. 235-261, 17 ref.); Development and construction of microwave ovens (pp. 262-285, 27 ref.); Materials, accessory devices, and components (pp. 286-321, 15 ref.); Heating and cooking by microwaves (pp. 322-331, 4 ref.); Guide to domestic microwave cooking (pp. 332-359, 47 ref.); Microwave heating and commercial food systems management (pp. 360-375, 1 ref.). [Continued in following abstr.] VJG

15

Microwave heating. [Book]
Copson, D. A.
Ed. 2, xi + 615pp. (1975) [En] Westport, Connecticut, USA; AVI Publishing Co. Inc. Price $38 (USA) $39 (Foreign) [Dep. of Biol., Univ. of Puerto Rico, Mayaguez, Puerto Rico]

[Continued from preceding abstr.] Microwave heating and meal management in various systems (pp. 376-391, 24 ref.); Practical application of microwave heating in the hospital food service system (pp. 392-437, 8 ref.); Nutritional, microbiological, and other experimental aspects (pp. 438-477, 98 ref.); Industrial and commercial microwave heating applications (pp. 478-515, many ref.); Applications engineering (pp. 516-546, many ref.); Radiation biology of microwaves (pp. 547-569, many ref.); and Precautions with microwaves and exposure standard (pp. 570-579). 3 appendices are included: Heating of water - power required for temp. rise/min (p. 580); Microwave heating suppliers of equipment (pp. 581-592); and Reference books, teaching aids, and useful publications for microwave ovens and their use (pp. 593-595). VJG

16

[Frozen fish thawing.]
Nippon Suisan Co. Ltd.
Japanese Patent 5 033 141 (1975) [Ja]

Frozen fish blocks are heated by microwaves to increase their temp. to 0-3°C. Individual fish are separated, packed individually and refrozen. IFT

17

Analysis of comminuted meat.
Davis, K. E.; Watson, W. M. (Hobart Corp.)
United States Patent 3 916 670 (1975) [En]

A preweighed sample of comminuted meat, particularly beef, is exposed to microwave heating for sufficient time to achieve a relatively constant chemical analysis, particularly the fat content, of the residue. Vaporized fat and moisture are weighed as well as fat released during heating. GL

18

The value of microwave radiations in the processing of full-fat soybeans.
Wing, R. W.; Alexander, J. C.
Canadian Institute of Food Science and Technology Journal **8** (1) 16-18 (1975) [11 ref. En, fr] [Dep. of Nutr., Univ. of Guelph, Guelph, Ontario, Canada]

The value of processing unextracted soybeans by microwave radiations has been investigated. The optimum heating required to produce beans of good nutritive quality, as judged chemically by the cresol red dye absorption test, was determined and found to be in the range of 2 to 3 min. The effect of microwave heating on the fatty acid content of soybean was examined using GLC and it revealed that processing for periods of ≤6 min resulted in no

destruction of the fatty acids. Beans produced under the selected microwave conditions (2450 MHz, 1250 W) were compared with beans processed by conventional heating techniques for their ability to support rat growth. It was shown that microwave processing can yield beans of high nutritive value, which compared favourably to beans processed by conventional heating techniques. AS

19

Degradation of starch polymers by microwave energy.
Khan, A. R.
Dissertation Abstracts International, B **36** (5) 2143: Order No. 75-25043 (1975) [En] [Kansas State Univ., Manhattan, Kansas 66502, USA]

3 concn. [not given] of aqueous starch at neutral pH were heated using microwave energy for 3 periods of time [not given] in sealed glass tubes. Acidified starch suspensions of a single concn. [not given] were heated at the same microwave energy level for comparison. Hydrolysates were analysed for total acidity, total sugars, reducing sugars and glucose. Total acidity and sugar concn. increased with starch concn. and duration of heating. Starch hydrolysis as high as 93.25% was achieved. Extensive production of sugars was noted after a relatively short period of heat treatment in acidified starch suspensions; ≤94.8% total sugars were formed. It is concluded that microwave energy can be successfully and efficiently utilized for production of sugar syrups of high DE in a short period of time. JA

20

[Intensification of bakers' yeast drying.]
Krasnikov, V. V.; Ostapenkova, T. N.; Ostapenkov, A. M.; Semikhatova, N. M.
Khlebopekarnaya i Konditerskaya Promyshlennost' No. 7, 27-30 (1975) [Ru] [Moskovskii Ordena Trudovogo Krasnogo Znameni Tekh. Inst. Pishchevoi Promyshlennosti, USSR]

The possibility of using high-frequency heat for drying bakers' yeast was studied. Drying was carried out in laboratory equipment of the Slavyanka oven type, consisting of a high-frequency energy generator, control panel, drying chamber and air pipeline. A diagram of the equipment is presented. Curves of drying kinetics and yeast fermentability changes were obtained showing that a reduction in the output of the generator adversely affected fermentability. The most favourable drying conditions, ensuring unchanged yeast fermentability, were established. Yeast quality is greatly affected by the content of trehalose; best results were achieved with 11.6%. The most favourable relationship between high-frequency energy generation and aeration rate is different for each yeast strain. It was concluded, on the basis of biochemical analysis, that yeast dried in a high-frequency field is of very good quality. STI

21

Microwave and conventional cooking in relation to quality and nutritive value of beef and beef-soy loaves.
Ziprin, Y. A.; Carlin, A. F.
Journal of Food Science **41** (1) 4-8 (1976) [17 ref. En] [Food & Nutr. Dep., Coll. of Home Economics, Iowa State Univ., Ames, Iowa 50011, USA]

Beef or soy flavour of meat loaves containing 0 or 15% soy flour or 15% soy concentrate was evaluated after cooking in microwave or in conventional ovens. Also, cooking time, cooking losses, fat and moisture contents and thiamin retention were determined. Beef or soy flavour was significantly affected ($P < 0.01$) by loaf type, but not by oven treatment. Loaves (960 g) cooked electronically reached 74°C in 19 min and had consistently higher cooking losses than those cooked conventionally for 78 min. Substitution of 15% soy reduced cooking losses more in loaves cooked in electric than in microwave ovens. Soy had no effect on the fat content, but cooking had a significant ($P < 0.01$) effect; i.e., 11.5% fat in electronically and 9.6% in conventionally cooked loaves. Thiamin retention was not affected by 15% soy substitution. The average thiamin content, regardless of treatment, was 0.09 mg/100 g of the cooked loaves. IFT

22

In-line microwave tempering upgrades quality of sliced meats.
Aronowicz, J.
Food Processing **36** (12) 54-55 (1975) [En] [Leo's Quality Foods, Los Angeles, California, USA]

A 50 KW microwave tempering tunnel is used for thawing 5000 lb/h of frozen meat to a condition suitable for slicing prior to reformed meat product manufacture. 2-5 min tempering allows control of the block centre temp. at ±1%C, and eliminates drip-losses. JRR

23

[Nutritional value of meat products processed by a new industrial frying process.]
Asp, N.-G.; Burvall, A.; Öste, R.; Dahlqvist, A.
Näringsforskning **19** (2) 91-97 (1975) [10 ref. Sv, en] [Advelningen för Ind. Näringslära, Kemicentrum, Box 740, 220 07 Lund 7, Sweden]

Samples of (i) 'Hamburgare' (a beef product with a high content of fat and added potatoes and cereal) and (ii) 'Biff pa bit' (a low-fat beef product without added carbohydrates) were used in comparative studies on effects of normal deep-fat frying or cooking by the Inpro method (combined surface frying and microwave heating) on composition and nutritional value. Tables of results are given for the fat, protein, carbohydrate and energy contents, fatty acid composition, digestibility and protein nutritional value of raw (i) and (ii), and

samples cooked by the 2 methods studied. Conventional frying increased the fat content of the meat products, especially (ii), altered the fatty acid composition and reduced the protein efficiency ratio. Cooking by the Inpro method had little effect on composition or nutritional value of the products. AJDW

24

Microwave challenge today' heat processing.
Schiffmann, R. F.
Food Engineering **47** (11) 72-76 (1975) [En] [Bedrosian and Associates, Alpine, New Jersey, USA]

This survey of the application of microwave heating in food processing discusses the basic principles of the process, developments in its use over the last 10 yr, its advantages with regard to product quality and savings in costs and energy, and possible future applications, e.g. in baking, freeze-drying, vacuum drying, cooking, sterilization, pasteurization. A number of current specific applications are discussed, e.g. meat tempering, doughnut proofing and frying, pasta drying, fish thawing. JA

25

[Heating of potatoes and vegetables in a high frequency current field.]
Kretov, I. T.; Popov, V. I.; Kravchenko, V. M.
Izvestiya Vysshikh Uchebnykh Zavedenii, Pishchevaya Tekhnologiya No. 2, 127-128 (1975) [2 ref. Ru] [Voronezhskii Tekh. Inst., USSR]

The effect of electro-magnetic field energy and water content of potatoes and vegetables (carrots and beetroots) diced into 10 × 10 × 10 mm cubes on the heating rate in a high frequency current field (20 MHz) was studied. An equation was obtained for the calculation of heating processes, which may be used within the RH range of 15-100% and a field range of 0.7-2.4 W/m^2. STI

26

[Measurement of grain moisture content.]
Anon.
Revue de la Conserve Alimentation Moderne No. 40, 87-88 (1975) [Fr]

This rapid method for measuring grain moisture content is based on the reduction in transmission of microwaves (3 giga-Hz) due to absorption by the moisture present. With a 15 cm stainless steel Goubau probe, a reduction of 0.9-1.0 decibels is produced in air by each 1% of water vapour at 20°C. Over the range 5-20% moisture there is a linear relationship between reduction in transmission and moisture content. The probe is immersed in a 5 kg sample of grain and the drop in transmission is automatically converted to a reading of % moisture. Calibration of the instrument for different types of grain is necessary. MEG

27

[Process for freshening old baked bread.]
Verfahren zum Auffrischen von altbackenem Brot.
Wepu Brotfabrik Hugo Merten
German Federal Republic Patent Application 2 434 261 (1976) [De]

Bread which is up to 5-7 days old is made attractive by treating it with microwave energy, preferably at a frequency of 2450 MHz and at a power of 600 W for 2-4 min. To avoid loss of moisture, it is preferable to enclose the loaf in an impermeable plastics foil. Crispness of the crust is improved by radiation during or after the microwave treatment. W&Co

28

[Applications of microwaves in the food industry.]
Meisel, N.
Revue Generale du Froid **67** (1) 9-20 (1976) [Fr]

29

[Effect of method of reheating for serving on quality of meat dishes.]
Sowa, T.
Roczniki Instytutu Przemyslu Miesnego **12**, 103-114 (1975) [23 ref. Pl, ru, en] [Katedra Tech. i Jakosci Produkcji, SGPiS, Warsaw, Poland]

Various conventionally prepared and cooled meat dishes (hamburgers, roast pork, beef or pork cutlets, braised beef and frankfurters) were stored at 4°C for 2-10 days, and were then reheated either (i) customarily (10-18 min in fat at 160-180°C for dishes other than frankfurters) or (ii) by high-frequency current (15 or 27 MHz and 0.8-1.8 kV in dish, for 5-8 min). Data on moisture, fat, and protein contents before and after reheating, H_2S production during reheating and organoleptic evaluation are tabulated. The main findings were: (ii) dishes had better taste, colour and consistency and were more succulent than (i) dishes; they contained more water and less fat than (i) dishes; and they showed less damaged to S amino acids than (i) dishes. The technological advantages of (ii) treatment are pointed out and the procedure is recommended for wide application in mass catering establishments. SKK

30

The effects of thermal processing and cooking methods on residues of DDT and its metabolites in beef.
Lane, L. G.
Dissertation Abstracts International, B **36** (7) 3294: Order No. 76-79 (1976) [En] [Mississippi State Univ., Starkville, Mississippi, USA]

The Steritort process (260°F for 66 min) gave a smaller decrease in DDT and DDT metabolite levels in naturally contaminated beef than the Steritort process (220°F for 342 min), microwave cooking, and broiling. DDT was determined by electron capture gas chromatography after

aluminium oxide cleanup of fat. Ground beef was spiked with p,p'-DDT in ethanol-water; the Steritort process (220°F for 342 min) and broiling of patties for 4 min on each side gave different levels of pesticide loss, broiling being less effective. With naturally contaminated beef, the 2 cooking methods gave similar results. It is therefore concluded that studies on pesticide residues should be conducted with naturally contaminated and not artificially spiked samples. JA

31

Multi-energy source wave oven and microwave thawing of packaged meat.
Decareau, R. V.
Activities Report **27** (1) 46-51 (1975) [1 ref. En] [US Army Natick Lab., Natick, Massachusetts, USA]

A research oven, designed to achieve high yield and quality of roast beef through close temp. and time control, incorporated the following features: pressure controllable at 34.5, 68.9 and 103.4 kN/m^2 (5, 10 and 15 lb/in^2 gauge) with steam provided by a self-contained electrically powered source, 2 microwave energy sources operating at 2450 and 915 MHz, a radiant heat source controllable at 121-260°C, a means for rapid exhaust and a programming device for controlling energy sources. Microwave thawing or tempering of frozen meat was studied by means of a QMP 1679C Radarline Tunnel Microwave system operating at 915 MHz, 25 kW. Evaluation of samples of beef and pork roasts, corned beef, whole and cut up chicken, turkey rolls and diced beef stored at -17.8°C showed that for frozen corned beef and whole chicken best results were obtained with product initially at low temp. Diced beef and cut-up poultry pieces were easily separated and ground beef could easily be broken apart. Satisfactory results were also achieved with a load of mixed products. RM

32

Destruction of Salmonella typhimurium and Escherichia coli in microwave cooked foods.
Culkin, K. A.; Fung, D. Y. C.
Abstracts of the Annual Meeting of the American Society for Microbiology **74**, 9 (1974) [En] [Pennsylvania State Univ., University Park, Pennsylvania 16802, USA]

Liquid foods (tomato soup, vegetable soup and beef broth) inoculated with Salm. typhimurium or E. coli were subjected to microwave (915 MHz) treatment. At various time intervals (15-180 s), % survivors and temp. in the top (T), middle (M), and bottom (B) food regions were monitored. For any given exposure time, M was the warmest, B intermediate, and T coolest (e.g. tomato soup, 90 s exposure: T, 43°C; M, 55°C; B, 52°C). Yet despite the relative temp. achieved, the closer the sampled organisms were to T (microwaves enter at the top of the oven) the greater their destruction for any given exposure time (e.g. Salmonella in tomato soup, 90 s; T, 0.037% survival; M, 0.41%; B, 4.1%). When survival was correlated with temp., organisms in T had declined to a given level of survival at a lower temp. than the temp. corresponding to the same survival level in other regions (e.g. 1% survival of Salmonella in tomato soup; T, 42°C; M, 55°C; B, 58°C). These data suggest that the heat generated during the microwave exposure alone is inadequate to fully account for the nature of the lethal effects of microwaves for microorganisms. AS

33

Radio frequency and microwaves.
Minett, P. J.
Food Processing Industry **45** (532) 36, 38, 41 (1976) [7 ref. En]

The principles of radio frequency and microwave heating are outlined and a comparison made with conventional heat transfer methods. Microwave defrosting of meat is described. The application of radio frequency and microwave heating to the drying of foods is discussed. Post-baking of biscuits is used as an example. Benefits offered by radio frequency and microwave heating include: heating without surface heat transfer limitations; selective heating of wet areas; compact rapid heating; repeatability; saving of fuel and materials; and better products and freedom from pollution. VJG

34

Microwave heating.
Shute, R. A.
Food Processing Industry **45** (532) 41, 43 (1976) [En]

Consideration is first given to low and high loss angle material and to temp. control during drying. Applications of microwaves to vacuum drying, heating, baking, dehydration of meat, and soup heating is briefly considered. The economics of the process is discussed. VJG

35

Microwave oven.
Husqvarna Vapenfabriks AB
British Patent 1 425 366 (1976) [En]

A microwave oven includes a lithium chloride probe to measure liberated moisture and control the heating cycle. IFT

36

Soy milk.
Drachenberg, F. G.; Allred, P. E.
United States Patent 3 941 890 (1976) [En]

Manufacture of soy milk involves cooking with microwaves to substantially destroy trypsin inhibitors without any appreciable roasting of the material. IFT

37

Microwave methods with bakery products.
Anon.
Food Processing Industry **45** (532) 44 (1976) [En]

A description is given of 3 ways of applying microwave energy to doughnut production. These are: a proofer for yeast-raised doughnuts; applicators for cake doughnut fryers; and an in-

store bakery system. In this way proofing time is reduced from 30 min to <4 min; the finished doughnut retains 3-5% more moisture, lengthening its shelf-life and improving its eating quality; the shorter frying time reduces fat absorption by ≤25%; and bakeries are able to reduce costly daily deliveries to 1 or 2/wk and still offer fresh food. VJG

38

Microwave meat roasting.
Nykvist, W. E.; Decareau, R. V.
Journal of Microwave Power **11** (1) 3-24 (1976) [27 ref. En] [US Army Natick Development Cent., Natick, Massachusetts 01760, USA]

Investigation of microwave and conventional heating of cylindrically shapped beef roasts, excluding end heating effects, has led to a better understanding of the microwave and heat transfer phenomena involved. A computer programme written to simulate microwave/conventional cooking of cylindrical meat roasts has demonstrated good agreement with limited experimental data. It was found that the cylindrical shape of roasts used in this work gave an advantage to the microwave frequency with deepest penetration, 915 MHz, in both cooking time and final temp. uniformity due to "focusing" of microwave energy at the roast central axis. Widely used 2450 MHz microwave power was shown to be notably inferior to 915 MHz for roasting beef cylinders with diam. >6 cm. While no definite conclusion can be made concerning an optimum cooking method, methods using 300 W at 915 MHz, or the combination of 600 W at 915 MHz for the first 20 min and 300 W at 915 MHz thereafter appear to be superior. AS

39

Frankfurter searing tray for use with microwave energy.
Bowen, R. F. (Raytheon Co.)
United States Patent 3 943 320 (1976) [En]

Microwave cooking apparatus for searing and cooking frankfurter-type products is described. IFT

40

Microwave cooking of frozen pork using plastic film.
Wooldridge, M. C.
Dissertation Abstracts International, B **35** (11) 5519: Order No. 75-10986 (1975) [En] [Purdue Univ., Lafayette, Indiana, USA]

Sliced or ground pork longissimus dorsi muscle in plastics film pouches was cooked from the frozen state by microwaves and in a conventional electric oven. Palatability scores were not significantly different for the 2 cooking methods, except for a preference for conventionally cooked slices because of greater tenderness. Patties were more tender and juicy than slices. Total moisture decreased and total lipid increased on cooking and differences between the 2 methods were not significant. Thiobarbituric acid value was higher in cooked than in raw samples. Total cooking loss was higher for thin than for thick slices. Total drip loss was less for microwave cooking due to greater evaporative loss. For patties, more lipid was found in the drip from microwave cooking than from conventional cooking. % distribution of 5 major fatty acids in cooked slices did not differ significantly due to cooking method. Cooking time with microwaves was ⅓-¼ that required for conventional cooking. JA

41

The biological value of meat loaves produced by means of super-high frequency heating. [Lecture]
Pedenko, A. I.; Nakonechnyi, N. S.; Lerina, I. V.; Belova, T. S.; Tkachenko, L. F.; Rogov, I. A.; Bol'shakov, A. S.; Fomin, A. K.
Proceedings of the European Meeting of Meat Research Workers **19** (Part II) 977-994 (1973) [11 ref. En, Ru, de] [Vses. Nauchno-issled. Inst. Myasnoi Promyshlennosti, USSR]

Comparative studies conducted on the quality of meat loaves (70% cured lean beef, 30% cured fat pork) cooked by microwave heating or in a conventional rotary oven are described. Composition, organoleptic properties, physical properties, digestibility, and microbiological quality of the meat loaves were studied. Microwave-heated samples were at least equal in quality to conventionally-heated samples. No formation of toxic factors during microwave heating was observed. [See FSTA (1976) **8** 9S1589.] AJDW

42

[A study of the effect of super-high frequency energy on the quality characteristics of quick-frozen semi-prepared meat during culinary processing.] [Lecture]
Zayas, Yu. F.; Rebane, L. V.; Zhizhokina, N. A.; Khromova, R. A.; Izotova, L. I.; Boravskii, V. A.; Bol'skahov, S. A.
Proceedings of the European Meeting of Meat Research Workers **19** (Part III) 1185-1201 (1973) [Ru, De, en] [Vses. Nauchno-issled. Inst. Myasnoi Promyshlennosti, USSR]

Effects of microwave heating (for ≤15 min) on various quality characteristics (moisture content, yield, pH, colour, organoleptic properties, microbiological quality, fat oxidation) of meat products were studied. Control samples were conventionally heated. Tables of results are given. Microwave heating for 4-5 min gave an acceptable product, which did not differ significantly from conventionally-heated samples. Prolonged microwave heating significantly reduced moisture content and yield, and increased fat oxidation. [See FSTA (1976) **8** 9S1589.] AJDW

43

Microwave heating of food materials at various altitudes.
Lorenz, K.; Dilsaver, W.
Journal of Food Science **41** (3) 699-702 (1976) [11 ref. En] [Dep. of Food Sci. & Nutr., Colorado State Univ., Fort Collins, Colorado 80523, USA]

Temp. differences, moisture losses and viscosity

changes of food products prepared in a microwave oven at different elevations were determined. Experiments with apples, potatoes, squash, ground meat, scrambled eggs, custard sauce and soups were carried out at atmospheric pressures equivalent to sea level, and 2500 ft, 5000 ft, and 7500 ft of elevation. Results indicated that altitude affects final temp. and wt. losses of foods heated in a microwave oven and has to be considered when microwave heating conditions are established for the high altitude region of the USA. IFT

44

Influence of cooking on toxic stress metabolites in sweet potato root.
Cody, M.; Haard, N. F.
Journal of Food Science **41** (2) 469-470 (1976) [8 ref. En] [Dep. of Food Sci., Rutgers State Univ., New Brunswick, New Jersey 08903, USA]

Microwave and bake cooking operations destroyed approx. 90% of the ipomeamarone in sweet potato roots. 4-ipomeanol was more heat stable than ipomeamarone, although it also decreased substantially as a result of normal cooking. These findings are contrary to a previous report which indicated that these toxins were not destroyed by cooking [FSTA (1970) **2** 10J1125]. IFT

45

Microwave dissipation loss in high moisture grain.
Gorakhpurwalla, H. D.; McGinty, R. J.; Watson, C. A.
Journal of Agricultural Engineering Research **20** (3) 225-233 (1975) [21 ref. En] [Dep. of Electrical Eng., Texas A&I Univ., Kingsville, Texas 78363, USA]

Dissipation losses were characterized for high-moisture corn and grain sorgum samples ar microwave frequencies ranging from 0.915 to 8.0 giga Hz. Effects of bulk grain temp. on dissipation loss are discussed. AS

46

Degradation of 1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane (DDT) in beef by canning and cooking.
Hearnsberger, A. P.; Kilgore, L. T.; Rogers, R. W.
Journal of Agricultural and Food Chemistry **24** (3) 677-678 (1976) [14 ref. En] [Home Economics Dep., Mississippi State Univ., Mississippi State, Mississippi 39762, USA]

Naturally contaminated beef samples containing 5 and 8 ppm of total DDT (DDE, DDD, and DDT) were processed and cooked by 2 different methods in a steritort. Both processing methods (104°C, 137 min; 126.7°C, 66 min) reduced total DDT in the fat of beef. A mean loss of 20% occurred in fat below tolerance (i.e. 5 ppm samples) and a 10% loss in the fat above the tolerance level (i.e. 8 ppm samples). Cooking of steritort-processed beef by microwaves or in a conventional oven resulted in a 17% further loss. AS

47

[The biological value of microwave-heated meat products.] [Lecture]
Shumkov, E. G.; Bulgakova, L. I.
Proceedings of the European Meeting of Meat Research Workers No. 20, 199-201 (1975) [12 ref. Ru, en, de, fr] [Vses. Nauchno-issled. Inst. Myasnoi Promyshlennosti, USSR]

The biological value of Frankfurters manufactured by a microwave-heating process was studied by means of rat feeding trials and in-vitro digestibility trials; tables and a graph of results are given. The results show that the microwave-heating process gave higher nutritional value and better in-vitro protease digestibility than the conventional process. [From En summ.] [See FSTA (1976) **8** 10S1831.] AJDW

48

[Effects of microwave pre-heating and freeze-drying on the quality of pork.] [Lecture]
Zayas, Yu. F.; Izotova, L. I.; Zhuravskaya, N. K.
Proceedings of the European Meeting of Meat Research Workers No. 20, 276-278 (1975) [2 ref. Ru, en, de, fr] [Vses. Nauchno-issled. Inst. Myasnoi Promyshlennosti, USSR]

A comparative study was conducted on the quality of pork either conventionally pre-heated or microwave pre-heated before freeze-drying. Tables of results are given for numerous constituents and quality characteristics of the pork. The results show that microwave-heating gave smaller changes attributable to denaturation, and higher concn. of myofibrillar proteins and functional groups. Studies on rehydrated samples showed the microwave-preheated samples to have higher total N and residual N concn., better rehydration characteristics, higher water binding capacities and lower shear values. [From En summ.] [See FSTA (1976) **8** 1S1831.] **AJDW**

49

Two million microwave ovens yearly projected by industry for 1980.
Martin, S.
Quick Frozen Foods **37** (9) 40, 42, 84-85, 87 (1975) [En]

There are 1½ million microwave units in use in the USA. The 2 largest manufacturers, Litton of Minneapolis, and Amana of Amana, Iowa, share 60% of the total US market. Sales have increased due to a reduction in price (units now costing from $250 to $1000) which was brought about by an influx of models from Japan etc. Improvements which have taken place over the last 4 yr are: defrosting capability (a device shuts the power on and off automatically for 30 s at a time), variable power control, venting, and skillets for frying, searing, roasting, browning and various other cooking methods. Microwave ovens offer an energy saving of 50-75% over electric cookers. VJG

50

Rapid heating of liquid foodstuffs at 896 MHz.
Metaxas, A. C.
Journal of Microwave Power **11** (2) 105-115 (1976) [6 ref. En] [Electricity Council Res. Cent., Capenhurst, Chester, UK]

Studies on design of a TM_{010} resonant cavity unit (operating at 896 MHz) for microwave heating of pumpable foods are described; aspects considered include: differences in loss factors between foods; effects of aperture size and frequency on input voltage standing wave ratio; temp. effects; and field distribution with the cavity. Graphs of results are given for trials with an experimental TM_{010} resonant cavity heating unit; distilled water, tap water, gravy and milk were used in the experiments. Trials with water showed the microwave power utilization efficiency to be approx. 90% at an input power of 5 kW; rate of temp. increase was 162°C/s. AJDW

51

[New applications of microwaves in the food industry.]
Anon.
Industrie Alimentari **15** (5) 90-93 (1976) [It]

52

Determining moisture content of grain using microwave energy for drying.
Gorakhpurwalla, H. D.; McGinty, R. J.; Watson, C. A.
Journal of Agricultural Engineering Research **20** (3) 319-325 (1975) [6 ref. En] [Dep. of Electrical Eng., Texas A&I Univ., Kingsville, Texas 78363, USA]

An applicator with a rotating sample holder for determining moisture content of grains was developed. Drying curves for corn and grain sorghum, using an incidence power of 850 W at 2.45 giga-Hz, show a decaying exponential-type characteristic. The time required to dry 32.5 g of grain from an initial moisture content of about 35% to about 1% of its initial moisture content is about 12 min for corn and 16 min for grain sorghum. AS

53

[Effect of rate at which sausage meat products are heated by ultra high frequency energy on their readiness for use.]
Khlebnikov, V. I.; Abaldova, V. A.; Blinova, T. V.
Voprosy Pitaniya No. 1, 63-65 (1976) [7 ref. Ru, en] [Vses. Nauchno-issled. Inst. Ptitsepererabatyvayushchei Promyshlennosti Moskovskaya Oblast', USSR]

Tests to find the temp. at which sausage meat products are fully processed were conducted on raw meat from beef soaked in brine for 24 h at 4°, comminuted, and with 25% water added. Changes in acid phosphatase activity were studied at 1° intervals between 68° and 80°C, at rates of increase in temp. of 0.1°, 1°, 2°, 4°, 6°, 8° and 10°/s. The findings are expressed by the equation $t° = A + Bm - Cm^2 + Dm^3$, calculated by the method of least squares, where (t° is the temp., m the rate of heating (°C/s), A = 70.6°C, B = 2.1 s, C = 0.28 s^2/°C D = 0.87 × 10^{-2} s^3/°C^2). Good agreement was obtained with organoleptic and microbiological findings. At temp. increase of 4°C/s heat processing was complete only at 75.2°C, but as the rate increased or decreased a lower temp. sufficed. KME

54

[Continuous microwave cooking of meat.]
Untersuchungen zum kontinuierlichen Garen von Fleisch mittels Hochfrequenz.
Arndt, G.; Raeuber, H.-J.
Fleisch **30** (3) 52-56 (1976) [8 ref. De] [Sektion Verarbeitungs- & Verfahrenstech., Tech. Univ. Dresden, German Democratic Republic]

Studies on microwave cooking of pork and microwave heating of model substances are described; aspects studied included effects of the moisture content of the product on the microwave heating process, and effects of heating time on the consistency of the product. Excessive microwave heating times result in excessive wt. loss and surface drying of the meat. Mathematical modelling of microwave heating of meat is briefly discussed. IN

55

[Dielectric heating of meat products.]
Dielektrische Erwärmung bei Fleischerzeugnissen.
Klettner, P.-G.
Fleischerei **26** (10) 21-22, II (1975) [De, en, fr] [Bundesanstalt für Fleischforschung, D-8650 Kulmbach, Federal Republic of Germany]

Microwave heat treatment of meat and meat products is discussed, with reference to: microwave treatment procedures; factors influencing heating rate; penetration depth of the microwave radiation; microwave frequencies used; and applications (thawing, cooking, reheating, pasteurization). AJDW

56

[Use of micro-wave oven for determining the moisture content of banana, cassava flour, pressed yeast and clay.]
Borzani, W.; Oliveira Prado, A. de
Revista Brasileira de Tecnologia **3** (1) 25-28 (1972) [5 ref. Pt, en] [Inst. Maua de Tecnologia, Sao Paulo, SP, Brazil]

The moisture contents of banana, cassava flour and pressed yeasts were determined by (i) the conventional technique using a standard oven, and by (ii) a microwave technique (2450 MHz, 50W). Mean SD obtained with (i) and (ii) respectively were: banana, 0.3-0.4 and 0.3-0.8%; cassava flour, 0.1 and 0.3%; and pressed yeasts, 0.3 and 0.7%. (ii) is recommended on the basis of both accuracy and speed. HBr

57

A review of microwaves for food processing.
[Review]
Sale, A. J. H.
Journal of Food Technology **11** (4) 319-329 (1976) [36 ref. En] [Unilever Res., Colworth/Welwyn Lab., Colworth House, Sharnbrook, Bedford MK44 1LQ, UK]

Ideas for the application of microwave heating to the processing of food are reviewed. A selection has been made of ideas for pasteurizing, sterilizing, defrosting, dehydrating, cooking and other applications that are described in the literature. Several are discussed to illustrate particular aspects and characteristics of microwave processing, and to try to show some reasons for the successes and failures. Microwave heating on its own has led to few commercially successful processes; however, when combined with conventional sources of heat, microwave heating appears to have greater potential, and has led to several successful processes. AS

58

Apparatus for continuous microwave sterilization of food in pouches.
Kanyon, E. M.; Berkowitz, P.; Ayoub, J. A. (**United States of America**, Secretary of the Army)
United States Patent 3 961 569 (1976) [En]

Apparatus for sterilizing food sealed in flexible microwave permeable pouches includes a microwave heated tunnel, pressurized above atmospheric pressure. IFT

59

Volatile flavor components of beef boiled conventionally and by microwave radiation.
MacLeod, G.; Coppock, B. M.
Journal of Agricultural and Food Chemistry **24** (4) 835-843 (1976) [45 ref. En] [Dep. of Food Sci. & Nutr., Queen Elizabeth Coll., London W8 7AH, UK]

Using a modified Likens & Nickerson extraction procedure [FSTA (1975) **7** 10Q152] followed by low temp./high vacuum distillation, representative samples of aroma volatiles were obtained from beef, both while boiling by microwave radiation and by conventional means. Separation of the components of the isolates was achieved by gas chromatography and the majority of the components identified using combined gas chromatography-MS. Odour assessments were made of the separated volatile components. A comparative study was undertaken of the effect on the volatile components of boiling for different periods of time conventionally and by microwave heating. AS

60

Pre-cooking of meat products.
Jeppson, M. R.
United States Patent 3 961 568 (1976) [En]

Apparatus for pre-cooking fatty meat products includes steam preheating means in combination with microwave energy heating means. IFT

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FAB 5

MICROWAVES IN FOOD PROCESSING

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H. BROOKES

ASSISTANT EDITOR

1

Microwave heating applied to moisture determination.
Steele, D. J.
Laboratory Practice **25** (8) 515-521 (1976) [En] [British Food Manufacturing Ind. Res. Ass., Randalls Road, Leatherhead, Surrey KT22 7RY, UK]

This article describes the development of an efficient method of applying microwave energy and the development of a practical instrument for rapid detn. of moisture in food. The sample to be measured is placed in a cylindrical cavity (approx. 95 mm diam. × 150 mm long); microwave energy (power adjustable from 20 to 200 W, frequency 2.450 GHz) is coupled into the cavity from a generator by a co-axial cable, incident and reflected power can be measured and the cavity tuned to resonance. Samples up to 6 g can be dried in 1.5-4 min. Results of moisture detn. of various foods by microwave heating (MH) and standard oven drying (OD) techniques are tabulated and compared. MH can be applied to meat products (e.g. sausage casings, pork sausage, shepherds pie, meat paste, game pate, faggots in gravy), soups, chutney sauce, and starch powder. Fruit juices with high moisture (approx. 90%) could be dried in 30-45 min, vs. 43 h for OD. Results for sodium caseinate (SC), lactose and fat concentrate gave a straight line correlation between moisture measured by MH and OD methods, but with SC progressively increasing error occurred. Self-raising flour, spray-dried skim-milk and butter gave consistently lower results with MH than OD (by 1.7, 0.9 and 2% respectively). Dried skim-milk, dried full-cream milk, whey powder, baby food flakes and chocolate crumb gave inconsistent results. Cereals (rice, split peas, etc.) gave low values due to charring after only 10% moisture was driven off. Toffee and sultanas gave poor results. The MH instrument should be calibrated for each particular product. Safety aspects of microwave radiation are mentioned. AL

2

[Heat processing.]
Tanabe Seiyaku Co. Ltd.
Japanese Patent 5 117 176 (1976) [Ja]

Foods are heated with high frequency wave energy. . IFT

3

Microwave heating of foods - changes in nutrient and chemical composition. [Review]
Lorenz, K.
CRC Critical Reviews in Food Science and Nutrition **7** (4) 339-370 (1976) [85 ref. En] [Dep. of Food Sci. & Nutr., Colorado State Univ., Fort Collins, Colorado, USA]

Industrial microwave applications and the number of domestic microwave ovens have increased considerably over the years, and microwave methods have been the subject of claims without a scientific basis. Heating foods in a conventional and a microwave oven to comparable internal temp. will generally result in greater moisture losses in the latter. Microwave effects on proteins and lipids are minor, and due to heat rather than the radiation itself. Data on effects on carbohydrates are virually non-existent. The degree of destruction of vitamins and pigments during microwave processing is not greater than that observed in conventionally heated foods, though differences in flavour of certain foods may occur. It is concluded that nutritional and chemical changes in microwave heated foods are of approx. the same magnitude as those in foods prepared or processed by conventional methods. Microwave radiation is not powerful enough to cause the formation of potentionally hazardous free radicals by chemical bond cleavage. AS

4

[Microwave drying of pasta products.] Mikrowellen beim Trocknen von Teigwaren.
Meisel, N.
Getreide, Mehl und Brot **30** (7) 187-189 (1976) [De]

Following introductory sections, discussing basic principles relating to microwave energy and giving relevant mathematical formulae, the application of microwaves for drying pasta products is discussed. Tabulated data record the reduction in microbial counts achieved by microwave drying of 'elbow' macaroni. For pasta, a 3-stage drying process is recommended, involving hot-air drying to reduce the moisture content from 32 to approx. 20%, microwave drying to reduce the moisture content to 14%, and finally an 'equalization' stage involving hot-air drying to a moisture content of 12.5%. Drying time is 40 min vs. 10 h with conventional drying methods. JVR

5

Microwave radiation for control of Tribolium confusum in wheat and flour.
Watters, F. L.
Journal of Stored Products Research **12** (1) 19-25 (1976) [20 ref. En] [Res. Sta., Agric. Canada, 25 Dafoe Rd., Winnipeg, Manitoba R3T 2M9, Canada]

The susceptibility of T. confusum to microwave energy was studied by irradiating vials of enfested wheat (8.5, 12.5 and 15.6% moisture) or flour (13.4% moisture) at 50-75°C. Mortality was a function of exposure time and moisture content, and was higher in wheat than in flour (70% extraction). After exposure for 105 s, wheats at 15.6, 12.5 and 8.5% moisture content had reached 75°, 68° and 51°C, with 100, 90 and 68% mortality of the adult form of T. confusum. RM

6

Effect of microwave and open flame heating on the microbial counts and weight loss of eel.
Chen, H.-C.; Wu, C.-Y.; Lin, H.-H.; Chung, C.-Y.
Bulletin of the Japanese Society of Scientific Fisheries [Nihon Suisan Gakkai-shi] **42** (4) 405-410 (1976) [5 ref. En] [Dep. of Fishery Tech., Kaohsiung Junior Coll. of Marine Tech., Chi Chin, Kaohsiung, Taiwan]

The decimal reduction time and the thermal death time of E. coli Type I in eel bouillion were studied, and the effects of microwave and open flame heating on microbial inactivation and wt. loss of eel fillet were compared. The thermal death time regression curve of E. coli in eel bouillion was found to have a Z value = 5.1°C. The values read from this curve were accurate with ≥90% confidence. The lethal effect on microorganisms in eel fillets treated by open flame was higher than that of microwaves at 2450 MHz if the results were evaluated on an equal wt. loss basis. The wt. loss of flame-heated fillet was 0.43% for every degree (°C) increase in temp. within the range from 50°C to 80°C, and for microwave-heated fillet was 0.44% between 42°C and 87°C. The combination of heating for 2 min over flame followed by 15 s in microwaves had almost the same effect in wt. loss and microbial counts as that heated for 5 min by flame alone. AS

7

Proximate analysis, free amino acid, vitamin and mineral content of microwave cooked meat.
Baldwin, R. E.; Korschgen, B. M.; Russell, M. S.; Mabesa, L.
Journal of Food Science **41** (4) 762-765 (1976) [13 ref. En] [Dep. of Food Sci. & Nutr., Univ. of Missouri, Columbia, Missouri 65201, USA]

Beef, pork and lamb roasts were cooked in two 2450 MHz microwave ovens, 1 operated at 220 V (1054 W cooking power) and 1 at 115 V (492 W cooking power), and in a conventional gas oven (163 ± 3°C). The only significant effect related to power level of microwave ovens was retention of thiamine, riboflavin and niacin which was less in meat cooked at 115 V than with the other 2 methods. There was a trend toward less retention of Na, chloride, P and Fe in meat cooked by microwaves than by the conventional method. Also, microwave cooking resulted in less formation of free amino acids than conventional cooking but total protein did not differ significantly. IFT

8

Economics and energy utilization aspects of the application of microwaves: a tutorial review.
Jolly, J. A.
Journal of Microwave Power **11** (3) 233-245 (1976) [22 ref. En] [School of Business & Public Administration, California State Univ., Sacramento, California 95816, USA]

Economic aspects of the use of microwave heating in industrial processes is discussed, with reference to the food industry and other industries. Evaluation of costs is discussed, with reference to an economical analysis decision model. Aspects considered include: efficiency of energy utilization; potential advantages of microwave process; and costs (capital cost, tube replacements, general maintenance, energy cost, floor space cost). As an example, the economics of conventional and microwave processes for baking of bread are discussed. AJDW

9

An update on the applications of microwave power in the food industry in the United States.
Schiffmann, R. F.
Journal of Microwave Power **11** (3) 221-224 (1976) [5 ref. En] [Bedrosian & Associates, Sherwood Court, Alpine, New Jersey 07620, USA]

The current status of the use of microwaves in the food industry in the USA is discussed, and compared with the situation in 1973. The number of installations has risen from approx. 35 in 1973 to approx. 78 in 1976. Applications include precooking of chicken, tempering of meat, proofing and frying of doughnuts, precooking of bacon, drying of pasta, drying of onions, coagulation of meat, and heating of nuts before slicing. Of these, the last 3 applications have been introduced since 1973. Specific advantages of microwave heating are discussed, and future prospects for use of microwaves in the food industry are considered. AJDW

10

Microwave energy in foam-mat dehydration process.
Rzepecka-Stuchly, M. A.
Journal of Microwave Power **11** (3) 255-266 (1976) [12 ref. En] [Dep. of Food Sci., Univ. of Manitoba, Winnipeg, Manitoba, R3T 2N2, Canada]

Comparative hot-air foam-mat drying and microwave foam-mat drying tests were conducted, using tomato paste (27% TS), orange juice concentrate (44% TS) and yellow Spanish onion puree (11% TS) as the test materials. Sample layers 3.2, 6.3 or 12.7 mm thick were studied. Tables and graphs of results are given. The results show that the microwave process considerably increased the drying rate, and increased the layer thickness which may be dried efficiently. No adverse effects of microwave processing on the quality (colour, rehydration properties) of the products were observed. AJDW

11

Popcorn package for microwave popping.
Brandberg, L. C.; Andreas, D. W. Pillsbury Co.
United States Patent 3 973 045 (1976) [En]

Popcorn sealed in a flexible, expandable pack, e.g. a gussetted paper bag, is ready for popping in a microwave oven of 600-1400 watts capacity. 1-5 wt. parts solid or liquid fat shortening and salt for flavouring are mixed with the popcorn. GL

12

High frequency heating.
Tanabe Seiyaku (Pharmaceutical) Co. Ltd.
Japanese Patent 5 117 176 (1976) [En]
Foods e.g. biscuits, sponge cake and smoked fish, are coated with pyruvaldehyde and amino acids and heated with high frequency energy. IFT

13

Pizza preparation.
Stangroom, M. National Convenience Stores
United States Patent 3 975 552 (1976) [En]
Microwave energy is used to dry a pizza crust to a moisture content of 2-8% before baking. IFT

14

Thermal and microwave energy for shrimp processing.
Rao, M. R. R.; Novak, A. F.
Marine Fisheries Review, National Oceanic and Atmospheric Administration **37** (12) 25-30 (1975) [15 ref. En] [Dep. of Food Sci., Louisiana State Univ., Baton Rouge, Louisiana 70803, USA]
Gulf coast shrimps were processed by either (i) 2450 MHz microwave energy or (ii) conventional boiling. A 10-member untrained sensory panel found no differences between the 2 methods for shrimp appearance, texture and taste. Chemical tests and microbiological assays were used to determine vitamin retention. Vitamin A was not found in tail meat. Compared with raw shrimps, % vitamin retention by methods (i) and (ii) respectively was: niacin, 77.48 and 82.36%; thiamin, 115 and 97%; riboflavin, 79 and 83%; pantothenic acid, 107 and 82%; and carotene, 96 and 110%. AL

15

[Position of microwave heating in food technology. I. Principle and methods of calculation.]
Bengtsson, N.
Livsmedelsteknik **16** (8) 348-351 (1974) [10 ref. Sv] [Svenska Inst. för Konserveringsforskning, Göteborg, Sweden]
The principle of microwave heating is described, with particular reference to the mathematics of the process. The dielectric constants and loss factors at 2450 MHz and 40°C of various foods (water, boiled potatoes, raw and cooked beef, cooked ham, maize oil) are given, showing the effect of differences in composition - particularly moisture and salt - on the 2 parameters. A nomogram is given for calculating the time required for microwave heating of various foods with a specific heat around 3.5 kJ/kg °C (e.g. meat, fish and vegetables). The role of the density and specific heat of foods on the heating process is discussed. HBr

16

[Microwave heating of foods. Potential applications and limits.]
Ohlsson, T.
Livsmedelsteknik **17** (2) 60-63 (1975) [Sv] [Svenska Inst. för Konserveringsforskning, Göteborg, Sweden]
The principle of microwave heating is discussed, with particular reference to variations in the absorption capacity of different foods, the effect of the thickness of the product, problems of uniformity of heating, role of packaging and heating vessel, and changes in nutritive value of food. A nomogram is given for calculating the heating time required for meat and fish products of approx. 70% moisture content in the range 0-100°C. HBr

17

A study on the phenolic content of potatoes.
Choi, H.-M.
Korean Journal of Food Science and Technology **8** (2) 80-84 (1976) [11 ref. En, ko] [Dep. of Food & Nutr., Florida State Univ., Tallahassee, Florida, USA]
2 potato var., Lasoda and Sebago, were cooked (i) in a conventional oven at 218°C for 45 min and (ii) in a microwave oven for 3 min. Fresh potatoes served as controls. The cooked samples and controls were subjected to analysis for total phenolic constituents, moisture content, and pH (controls only). Potato extracts were also subjected to TLC. The content of phenolic compounds in fresh potatoes was (mg/g, DM basis): Lasoda 3.63 and Sebago 1.71. Cooking reduced the content of phenolic compounds in both var. The content of phenolics in Lasoda was higher with method (ii) than with method (i); however, the content of phenolics in Sebago was higher with (i) than with (ii). Fresh Sebago potatoes contained a little more moisture than fresh Lasoda potatoes. Moisture loss on cooking was greater with (i) than with (ii) for both var. Fresh and cooked cortex samples of Lasoda contained chlorogenic acid and traces of caffeic acid; Sebago contained chlorogenic acid but no caffeic acid. In general, fresh Sebago pith, cortex, stem and bud had higher pH value than Lasoda. JA

18

[Use of microwave tunnel oven in M.M. mechanized lines for producing and wrapping pasta filata cheese.]
Anon.
Scienza e Tecnica Lattiero-Casearia **27** (3) 280-284 (1976) [It]
A description is given of an automated system for heating pasta filata cheese in a microwave oven at 2450 MHz prior to plasticizing and wrapping/sealing. The system ensures that the heating occurs under optimum product temp., moisture content, acidity and geometrical section conditions irrespective of throughput (800 to >3000 kg/h). ADL

19

Properties of beef cooked before rigor onset.
Cia, G.; Marsh, B. B.
Journal of Food Science **41** (6) 1259-1262 (1976) [20 ref. En] [Muscle Biol. Lab., Dep. of Meat & Anim. Sci., Univ. of Wisconsin, Madison, Wisconsin 53706, USA]

Bovine sternomandibularis muscles were cooked rapidly at various stages of rigor development. The pre-rigor tissue shortened considerably more than that in which rigor was established, but its cooking loss was less; it was also significantly more tender, particularly if cooked within about 3 h of slaughter. Changes in pH during cooking were small. At all stages of rigor onset, the samples cooked in a microwave oven were more tender than those cooked by boiling, and in the pre-rigor material, wt. Losses were smaller when microwave heating was used. The results suggest the possible use of pre-rigor meat in the preparation of pre-cooked, ready-to-eat, meat-based foods. IFT

20

[The effect of capacitive high-frequency heating on the water-holding capacity of meat. I. The effect of the protein denaturation rate on the water-holding capacity of beef during heating in a capacitive high-frequency field and in a water bath.] Einfluss der kapazitiven Hochfrequenz-Erwärmung auf das Wasserbindungsvermögen von Fleisch. I. Einfluss der Proteindenaturationsgeschwindigkeit im kapazitiven HF-Feld und im Wasserbad auf die Wasserbindung von Rindfleisch.
Oelker, P.
Nahrung **20** (8/9) 791-796 (1976) [2 ref. De, en, ru] [Sektion Nahrungsgüterwirtschaft & Lebensmitteltech., Humboldt-Univ., Berlin (GDR)]

Samples of colloid-milled beef longissimus dorsi and psoas major muscle were used in a study on effects of heating method (microwave heating vs. heating in a water bath), heating rate (fast or slow), final core temp. (55° or 70°C) and NaCl (samples with or without addition of 2% NaCl before heat treatment) on the water-holding capacity of beef. 30% distilled water was added to all samples before heating. Histograms of results are given. With microwave heating, rapid heating gave a higher water-holding capacity than slow heating. The reverse was true for water bath heating. In NaCl-free samples, microwave heating gave a poorer water-holding capacity than water bath heating; the reverse was true for samples with added NaCl. The 2 final core temp. gave similar total water losses with microwave-heated samples. With water bath-heated samples, heating to 55°C gave a higher moisture loss than 70°C in the absence of added NaCl, but a lower moisture loss than 70°C in the presence of added NaCl. The results are discussed in relation to denaturation rate. AJDW

21

[The effect of capacitive high-frequency heating on the water-holding capacity of meat. II. Changes in the water-holding capacity of beef as related to increasing temperature in the high-frequency field.] Einfluss der kapazitiven Hochfrequenz-Erwärmung auf das Wasserbindungsvermögen von Fleisch. II. Veränderungen des Wasserbindungsvermögens von Rindfleisch in Abhängigkeit von der steigenden Temperatur im HF-Feld.
Oelker, P.
Nahrung **20** (8/9) 797-805 (1976) [8 ref. De, en, ru] [Sektion Nahrungsgüterwirtschaft & Lebensmitteltech. Humboldt-Univ., Berlin (GDR)]

Samples of colloid-milled beef with 30% added distilled water (with or without addition of 2% NaCl or 2% NaCl + 0.3% $Na_2H_2P_2O_7$) were heated (i) by microwave heating or (ii) in a water bath to 11 temp. in the range 30-90°C. Loss of water during heating and during subsequent centrifugation was determined, and total moisture loss was calculated. Graphs of results are given. With both (i) and (ii) moisture losses tended to increase irregularly with increasing temp. (up to approx. 55°C in non-salted samples, throughout the temp. range studied in samples with added NaCl). Total moisture losses from non-salted samples were higher with (i) than with (ii). In samples with added NaCl or NaCl + $Na_2H_2P_2O_7$, moisture losses with (i) were lower than those with (ii), this difference being especially clear over the temp. range 65-75°C. Treatment with NaCl + $Na_2H_2P_2O_7$ had little advantage over treatment with NaCl alone. The mechanism of the effect of NaCl on water binding is briefly considered. AJDW

22

Microwave freeze-drying: a theoretical and experimental investigation.
Ang, T. K.
Dissertation Abstracts International, B **37** (2) 678-679 (1976) [En] [Univ. of Waterloo, Waterloo, Ontario, Canada]

An unsteady-state analysis of 2-dimensional freeze-drying, with microwave internal energy generation, was carried out. A mathematical model, taking into account the differences of the transport parameters with respect to the grain orientation of products, was developed, and freeze-drying experiments were carried out on beef using microwaves at 2450 MHz. In general, good agreement between the model and experimental results was obtained. For a 0.5-in cube of beef at a field strength of 100 V/cm, drying time in approx. 6.67 h. The max. applicable field strength is 130 V/cm, giving a drying time of 4.33 h. Above 130 V/cm, melting of the ice-core and/or overheating in the dried layer will occur. If the quality of the freeze-dried product is not of primary importance, drying times of <2 h are possible. In this case, the limiting factor would be corona discharge. Total pressure, and partial pressure of water vapour in

the vacuum chamber, have a significant effect on sample temp., but these factors have little influence on the overall drying time. The lowest possible pressure should be used in microwave freeze-drying. JA

23

[Application of radiation in the food industry.]
Utilisation des rayonnements dans les industries agricoles et alimentaires. [Conference proceedings]
Meisel, N. **France**, Association pour la Promotion Industrie-Agriculture (Chairman)
103pp. (1974) [Fr] 35 rue du General Foy, 75008 Paris, France; APRIA (London, UK; Food Trade Press Price £9.00)

This publication gives the full text of papers presented at this symposium, including; Microwaves, by N. Meisel (pp. 5-22); and Use of radiation in agriculture and the food industry - IR methods for quality evaluation, by -. Bruchard (pp. 67-77). The text of concluding discussions is also given (pp. 79-103). A further 3 papers are abstracted separately in FSTA, and are listed in the author index under **France**, Association pour la Promotion Industrie-Agriculture [Radiation Symposium]. AJDW

24

Dielectric heating as a unit operation in food processing - heating fundamentals and applications of radio frequency and microwaves.
Bengtsson, N. E.
Confructa **21** (1/2) 7-8, 10, 12, 14, 16-23 (1976) [19 ref. En] [Svenska Inst. för Konserveringsforskning (SIK), Göteborg, Sverige, Sweden]

The processing fundamentals of dielectric heating are first reviewed. Consideration is given to: the influence of food composition, and temp. and frequency, on the dielectric properties of foods; energy penetration into foods; factors affecting temp. distribution; and mode of application of dielectric heating. Differences between capacitive dielectric heating and microwave heating are discussed from a processing and equipment point of view. Applications of dielectric heating in the plant products field, on industrial or laboratory (pilot plant) scale, are tabulated. Applications discussed in more detail are thawing, blanching, sterilization and dehydration. VJG

25

Precooked farinaceous foods adapted for microwave heating and a syrup topping therefor.
Norris, H. R.; Niemand, C. H.; Andreas, D. W.
Pillsbury Co.
United States Patent 3 983 256 (1976) [En]

A packaged food product adapted to be heated in a microwave oven comprises a stack of cooked breakfast griddle food units, e.g. pancakes, waffles or French toast, with a soft porous crumb structure, together with a layer of syrup topping, which melts on the application of microwave energy. IFT

26

[Evaluation of the quality of microwave-heated comminuted meat products and sausages, on the basis of their structural and mechanical properties.]
Die Qualitätsbewertung der im elektromagnetischen Ultrahochfrequenzfeld behandelten Wurstmasse und Wurstwaren nach deren strukturell-mechanischen Eigenschaften. [Lecture]
Chlebnikow, W. I.[Khlebnikov, V. I.]; Machonina, W. N.[Makhonina, V. N.]; Gorbatow, A. W.[Gorbatov, A. V.]; Kossoj, W. D.[Kosoi, V. D.]
Proceedings of the European Meeting of Meat Research Workers No. 21, 95-98 (1975) [8 ref. De, en, ru] [Vses. Nauchno-Issled. Inst. Myasnoi Promyshlennosti, USSR]

Studies on the quality of microwave-heated beef/pork sausage meat are described; the studies were conducted on 50% beef/50% pork sausage meat, in which some or all of the pork was replaced by porcine backfat. Some batches contained ⩽40% added water. Graphs are given showing fat and total liquid losses and mechanical properties (shear stress, shear work, compression work) of samples containing various levels of backfat and added water, and the effects of composition and comminution conditions on protein extractability. The results are discussed in detail, in relation to development of a process for manufacture of microwave-cooked skinless frankfurters. [See FSTA (1977) 9 4S605.] AJDW

27

[Process for packaging cooked constituents of a meal, and heat-insulating box for same.]
Compagnie General de Distribution Cogedis
French Patent Application 2 291 918 (1976) [Fr]

A snack box is described in which the interior is shaped into spaces for containing individual components of a meal. The cover is arranged so that components which require to be reheated are screened by a heat-permeable material, while the other components are covered with a heat-insulting screen during heating in a microwave oven. The box as a whole is heat-insulating. W&Co

28

[Use of electromagnetic microwave energy in the curd-plasticizing process. I. Low-moisture curd.]
Bottazzi, V.; Battistotti, B.
Scienza e Tecnica Lattiero-Casearia **27** (4) 323-329 (1976) [5 ref. It, en] [Istituto di Microbiol. Lattiero-Casearia, Univ. Cattolica, Piacenza, Italy]

A study was made of the feasibility of using a microwave source for plasticizing curd at low moisture content, as an alternative to the traditional technology using water, which has marked disadvantages (fat losses, long operating times, variations in curd characteristics, etc.). Good results were obtained with a 2400 MHz microwave source, to which Provolone curds of about 40% initial moisture content and 51-53% fat in DM were exposed for 20-45 s; there were no fat losses and no changes in pH, and moisture losses ranged from

1.51% at 52°C to 2.34% at 81°C. These results compared favourably with processes in which curd was plasticized with water at 75-80°C, with a water/curd ratio of 1.07-1.60. It was also found that the microwave treatment had a marked bacterial inactivation effect, increasing the storage life of the product. A further advantage claimed for the microwave process is that the final pasta filata cheese has a more aromatic, buttery flavour because the curd is not treated with hot water. ADL

29

Cooking inoculated pork in microwave and conventional ovens.
Ockerman, H. W.; Cahill, V. R.; Plimpton, R. F.; Parrett, N. A.
Journal of Milk and Food Technology **39** (11) 771-773 (1976) [20 ref. En] [Ohio State Univ., Columbus, Ohio 43210, USA]

High quality (grayish-pnk, firm, dry) and pale, soft, exudative (PSE), aseptic pork muscle tissue was individually inoculated with Bacillus subtilis, Leuconostoc mesenteroides and Pseudomonas putrefaciens. These organisms were allowed to grow (48 h) in the pork tissue. The tissue was cooked by microwave and by conventional oven heating until internal temp. of 60°, 68°, 77° and 85°C were reached. Pork quality did not significantly affect bacterial destruction in this experiment. B. subtilis proved to be the most heat tolerant, L. mesenteroides intermediate, and P. putrefaciens the least in both cooking methods. Cooking temp. significantly reduced bacterial numbers and oven cooking was more effective at reducing % survival than microwave cooking for all 3 spp. AS

30

Thawing and tempering frozen meat. [Lecture]
Bezanson, A.
Proceedings of the Meat Industry Research Conference pp. 51-62 (1975) [6 ref. En] [Raytheon Co., Waltham, Massachusetts 02154, USA]

Thawing of frozen meat is a costly process which is often conducted by persons unaware or unconcerned with the effects on quality. Furthermore, many meat processors are not really aware of true thawing costs. Tempering represents an alternative to thawing for some applications. The common procedure of 'floor tempering' usually results in drip loss and does not provide real control over temper to permit further processing under optimum conditions. Controlled tempering can be carried out satisfactorily with the use of either a properly-engineered and operated tempering room employing racks and controlled air flow, or with microwave processing. Tempering with microwaves eliminates the thawed meat surface condition that is sometimes associated with air tempering. The process takes place in about 5 min, so there is little opportunity for bacterial growth. It also enables precise control of input to the meat, and thus enables tempering for heat balance considerations in sausage and hamburger patty operations. The in-line feature of microwave tempering allows improved control of the mechanical properties of meat, such as sliceability and formability, and results in increased yield of sliced, diced, coarse-ground, and formed products. [See FSTA (1977) 9 5S845.] AS

31

Exciting products for microwave ovens.
Fergusson, J. L.
Food Engineering International **1** (9) 24-26 (1976) [En] [Shimer Von Cantz, Philadelphia, Pennsylvania, USA]

It is expected that 20% of US homes will have microwave ovens by 1980 and that 34 million such ovens will be in use worldwide by 1980. Developments in the production of foods suitable for microwave cooking are discussed. These include Pillsbury's Hungry Jack Microwave Popcorn and Hungry Jack Microwave Pancakes, both specially formulated and packaged for microwave cooking. Both products are currently sold from vending machines. Both can be stored frozen for 6 months. It is recommended that both be held at 40°F for ⩾24 h prior to cooking since microwaves produce uneven heating in frozen products. Problems encountered with microwave cooking are outlined, e.g. production of rubbery products, off-flavour development, lack of browning, lack of crispiness, overheating. Browing can be achieved by incorporation of IR surface browning elements in the oven, by use of a dish with ferrite material in the bottom which when heated to 400°F prior to cooking browns (sears) the product it contains, or by using a browning mix or glaze. JA

32

[Possibilities and limitations of improvement of the quality of sterilized products.]
Tijskens, L.; Schijvens, E.
Voedingsmiddelentechnologie **9** (24) 31-33 (1976) [16 ref. Nl, en]

The potential for improvement of the quality of foods preserved by heat-sterilization is discussed, with special reference to HTST and UHT processes. A major limiting factor is, however, formation of a temp. gradient with consequent danger of overheating of the surface layers or underheating at the centre. Methods for partially overcoming this problem are discussed, including rotary sterilization, reduction of the distance from can surface to can centre (use of flat cans), or thin-layer processing (i.e. for aseptic canning). The potential for sterilization by microwave or electroconduction heating (both of which are based on heat generation within the product) is briefly considered. AJDW

33

[Causes of inadequate keeping quality of non-alcoholic beverages and some remedies.]

Tomasek, K.
Kvasny Prumysl **22** (8) 185-187 (1976) [20 ref. Sk, ru, en, de] [Pivovary a Sladovny, GRT, Bratislava, Czechoslovakia]

Contamination of raw materials, bottles, crown caps, and equipment are given as main reasons. Data are tabulated of average numbers of bacteria in some apparatus and equipment. In addition, the acidity of soft drinks and their saturation by CO_2 was studied, and methods were elaborated for improving the keeping quality of non-alcoholic beverages; these are pasteurization, cold conservation of the product, or application of various irradiation treatments. High-frequency heating was also tested with microwaves of 12×10^6 eVJ; max. vol. of liquid pasteruized was 400 l./h, with time of application 2 s. STI

34

Improving the flavour of decaffeinated coffee by radio frequency heating to rapidly dry coffee benas.
Fogel, H. P.; Holzberg, I. General Foods Corp.
United States Patent 3 989 849 (1976) [En]

Green coffee beans are decaffeinated using radio frequency heating for 2-90 min at 70-360° F to impart a porous structure to the beans. An improved flavour results in the decaffeinated coffee product when roasted. GL

35

[Microwave thawing of peaches. Comparative study of different thawing treatments.] Decongelation des peches par micro-ondes etude comparative de divers traitements de decongelation. [Thesis]
Dri, D.
38pp. (1976) [41 ref. Fr] 38, Rue des Ecoles, 75005 Paris, France; ESITPA [Lab. de Physiol. des Organes Vegetaux apres Recolte, CNRS, Sta. du Froid, 92190 Meudon, France]

After outlining the principles of microwave heating, experiments are described in which Parvie (var. Vivian) peaches, peeled or unpeeled, at 2 stages of maturity J-7 (green) and J+2 (ripe), halved and stoned immediately before rapid (tunnel) freezing and storage at -20° C for 7 months, were thawed by 3 different methods. These were: (i) at 20° C until the internal temp. of the peach half reached 20° C (approx. 8.5 h), (ii) at 20° C until the internal temp. reached 4° C (approx. 4.5 h) and then at 4° C for 4 h, and (iii) microwave treatment until the internal temp. reached 4° C (approx. 5 min) and then at 4° C for 8.5 h. The amount of exudate was measured after each treatment. That from J-7 fruit was much higher when they were peeled before freezing. The exudate from ripe fruit was about half that from green fruit and was less affected by peeling. Thawing treatments (ii) and (iii) gave lower amounts of exudate and were preferable for both J-7 and J+2 fruits. Method (iii) enables the fruit to be brought to a temp. of 4° C in a short time (5 min) with a low exudate loss and no immediate colour change. The application of the method to the fruit canning industry is discussed. MEG

36

[Heating of boiled grits in high-frequency currents.]
Kretov, I. T.; Kitaev, G. F.
Izvestiya Vysshikh Uchebnykh Zavedenii, Pishchevaya Tekhnologiya No. 4, 53-55 (1976) [1 ref. Ru] [Voronezhskii Tekh. Inst., Voronezh, USSR]

The drying of boiled grits can be intensified by heating in the electromagnetic field of a flat condenser at 27 and 40 MHz. Relationships between heating temp. and time at different moisture contents and voltages were derived. STI

37

[Drying of pasta with microwaves.] [Lecture]
Meisel, N.
Tecnica Molitoria **27** (12) 101-105 (1976) [It] [Soc. IMI, Epone, France]

This general lecture presented at the 7th Symposium on 'Durum und Teigwaren' in Detmold (Federal Republic of Germany) deals with the fundamentals of microwave heating and drying and with a description of the 1st industrial pasta microwave drier installed by Lipton Ltd. in Bramalea near Toronto (Canada) in 1971. SKK

38

Microwave dielectric properties of insects and grain kernels.
Nelson, S. O.
Journal of Microwave Power **11** (4) 299-303 (1976) [23 ref. En] [USDA, Richard B. Russell Agric. Res. Cent., Athens, Georgia 30604, USA]

This paper includes data for the dielectric constants and dielectric loss factors (at 9.4 giga-Hz) of hard red winter wheat samples, and of adult rice weevils (Sitophilus oryzae); these data are of potential use in studies on disinfestation of stored wheat by microwave heating. Effects of moisture content and bulk density on the dielectric properties of wheat are considered, with reference to tables and graphs of data. AJDW

39

[A new method for preparation of frozen meat for processing.] Eine neue Methode: gefrorenes Fleisch zur Verarbeitung vorbereiten.
Koop, L.
Fleischerei **27** (5) 17, II (1976) [De, en, fr] [Seffelaar & Looyen BV, Oldenzaal, Netherlands]

A microwave tunnel system for thawing or tempering of frozen meat for further processing is briefly described; the meat is transported through the tunnel on a variable speed conveyor.

Advantages claimed include rapidity (thawing in ≤5 min); uniform and accurately-controlled heating; elimination of protein losses, deformation and contamination of the meat; low space requirements; reduced labour requirements; elimination of energy wastage; and potential for adjustment of tempering temp. to give optimal emulsifying or water-binding characteristics of the meat. AJDW

40

Recent developments in heat treatment and heat sterilization of meats. [Lecture]
Bengtsson, N.
Proceedings of the European Meeting of Meat Research Workers No. 22, J0:1-J0:12 (1976) [45 ref. En] [SIK, Swedish Food Inst., Göteborg, Sweden]

Developments in heat processing of meat and meat products are discussed, with reference to tables and graphs of literature data. Aspects considered include: time/temp. development in relation to quality; process calculation and simulation; developments in frying and cooking methods; frozen and heat-sterilized convenience foods; warm-holding of heated foods; and microwave heating of foods. [See FSTA (1977) 9 6S988.] AJDW

41

[Intramuscular holes in cooked ham.] [Lecture]
Dumont, B.-L.; Fournaud, J.; Schmitt, O.
Proceedings of the European Meeting of Meat Research Workers No. 22, D5:1-D5:5 (1976) [1 ref. Fr, en, de, ru] [Lab. de Recherches sur la Viande, INRA, CNRZ, 78350 Jouy-en-Josas, France]

A brief account is given of studies on factors influencing development of intramuscular holes in cooked Paris hams made from frozen raw material. 3 freezing methods were tested: in liquid N, in a blast freezer at -20° C, or in a tunnel at -40° C; 4 thawing methods were studied: microwave thawing; still air thawing at 6° C; thawing in an air circulation tunnel at 17° C; or thawing in running water at 13° C. A table of results is given. No significant effect of freezing method on incidence of holes was observed. Microwave thawing gave the highest and water-thawing the lowest incidence of holes. Muscles differed considerably in susceptibility to hole formation, the rectus femoris and semitendinosus being the most commonly affected. 2 types of holes could be distinguished, differing in extent of packing of the surrounding muscle fibres. Microorganisms were found only in holes without abnormal packing of surrounding muscle fibres. It is concluded that thawing methods is the most important factor influencing development of holes. [See FSTA (1977) 9 6S988.] AJDW

42

A comparison of the chemical composition of boiled and roasted aromas of heated beef.
MacLeod, G.; Coppock, B. M.
Journal of Agricultural and Food Chemistry 25 (1) 113-117 (1977) [41 ref. En] [Dep. of Food Sci. & Nutr., Queen Elizabeth Coll., London W8 7AH, UK]

Using a modified Likens and Nickerson extraction procedure [FSTA (1976) 8 12S2097] followed by low temp./high vacuum distillation, representative samples of aroma volatiles were obtained from beef while cooking by microwave radiation and by conventional means. Separation of the components of the isolates was achieved by gas chromatography and the majority of the components were identified by combined gas chromatography/MS. A comparative study was undertaken of the effect of cooking variations on the volatile components liberated. Such variations included heating in the presence and in the absence of water and for different periods of time for both conventional and microwave heating methods. Results indicated that certain carbonyl compounds, sulphides, pyrroles, and pyridines are probably important contributors to roasted notes as opposed to boiled or brothy qualities of heated beef aroma. AS

43

Microwave versus water-bath precooking of turkey rolls.
Janky, D. M.; Oblinger, J. L.
Poultry Science 55 (4) 1549-1553 (1976) [7 ref. En] [Florida Agric. Exp. Sta., Gainesville, Florida 32611, USA]

15 Broad Breasted Large White turkeys, 22 wk. of age, were slaughtered in each of 3 trials. Each turkey was hand-deboned and formed into two skin-encased rolls. One roll from each bird was precooked electronically while the other was precooked in a water bath. After a 3 wk. period of frozen storage, the rolls were final-cooked in a conventional electric oven. 3 rolls from each precooking treatment were subjected to core sampling after preparation, after precooking and after final cooking and analysed for total aerobes and coliforms. Random samples were taken from each of the other 12 rolls in each treatment as bite-sized pieces of meat and presented to a group of experienced taste panellists for evaluation of flavour, tenderness and juiciness. Duplicate shear force values were obtained for light and dark meat from each of the rolls. All 12 rolls in each precooking treatment were weighed before and after cooking to determine yield. Yield was significantly greater from rolls precooked electronically. The panellists were unable to observe a significant difference in flavour or tenderness of the rolls due to the precooking treatments. Shear force values for rolls, precooked by either method, were not significantly different. The panellists rated microwave precooked samples significantly more juicy than water-bath precooked samples. There was no apparent difference in the effectiveness of either precooking method in reducing microbial populations. AS

44

Specification for safety of commercial electrical appliances using microwave energy for heating foodstuffs.
United Kingdom, British Standards Institution
British Standard **BS 5175**, 38pp. ISBN 0-580-09254-2 (1976) [En] Price £6.60 [2 Park Street, London W1A 2BS, UK]

The standard specifies requirements for the testing of microwave ovens with or without additional forms of heating. It applies to equipment using either single phase or polyphase supplies where voltage to earth is ≤250 V a.c. It does not cover the use of equipment in ships, vehicles or aircraft, and does not apply to continuous process ovens. AL

45

Special packages for microwave ovens.
Anon.
Food Engineering International 1 (11) 39-41 (1976) [En]

This paper is largely based on remarks made by A. E. Colato during a course on 'Microwave mastery', sponsored by New York University and held on May 14, 1976. The importance of package shape is first considered. The most perfect shape for a container for foods intended for microwave cooking is round with a raised area in the middle; sharp corners should be avoided and the sides of the container should be as vertical as possible. The foods should be spread over as large an area as possible and as thinly as practical to obtain the desired heating. The suitability of various materials as packages for foods intended for microwave cooking is then discussed. Most plastics materials are suitable as also are various types of glass (e.g. Fire-King ovenware, Pyrex). Use of metal containers is not generally recommended. Various packaging materials and containers produced by a number of American firms are briefly described. JA

46

Sensory comparison of four potato varieties baked conventionally and by microwaves.
Maga, J. A.; Twomey, J. A.
Journal of Food Science 42 (2) 541-542 (1977) [3 ref. En] [Dep. of Food Sci. & Nutr., Colorado State Univ., Fort Collins, Colorado 80523, USA]

A trained 20-member panel was asked to rank 8 potatoes (1 of each variety baked conventionally and one of each baked by microwave) from best to worst on the basis of external appearance, internal appearance, aroma and flavour. Different potatoes were randomly presented for each sensory property evaluated with each evaluation being repeated 3 times. Statistical evaluation of the pooled data revealed that an experimental variety (WC-230-14) was significantly superior in external appearance, odour and flavour for both baking procedures. Among the other varieties, conventionally baked potatoes ranked ahead of the corresponding microwaved potato. IFT

47

Effects of conventional baking, microwave baking, and steaming on the nutritive value of regular and fortified breads.
Tsen, C. C.; Reddy, P. R. K.; Gehrke, C. W.
Journal of Food Science 42 (2) 402-406 (1977) [25 ref. En] [Dep. of Grain Sci. & Ind., Kansas Agric. Exp. Sta., Kansas State Univ., Manhattan, Kansas 66506, USA]

The nutritive value of protein in regular and fortified breads was significantly affected by methods of baking. Rat feeding tests demonstrated that protein efficiency ratios (PER) of breads were significantly improved and feed conversion ratios were reduced by substituting steaming or microwave baking for conventional baking. Lysine and other amino acids varied little among conventionally baked, microwave baked, and steamed breads. The significantly low PER of conventionally baked bread indicated that lysine became less available nutritionally with conventional baking than with either microwave baking or steaming. Lysine or soy fortification could effectively raise the PER of conventionally baked bread. Loaf vol. and crumb qualities of conventionally baked bread were better than those of microwave-baked or steamed bread. However, conventional baking produced a much darker brown crust and crumb than did microwave baking or steaming. The effect of heating, as shown by browning, on reducing the bread's nutritive value could be greatly minimized by replacing conventional baking with microwave baking or steaming. IFT

48

Microwave and conventional cookery of hot and cold processed pork loins.
Montgomery, T. H.
Dissertation Abstracts International, B 36 (10) 4927: Order No. 76-7377 (1976) [En] [Texas Tech Univ., Lubbock, Texas 79406, USA]

20 crossbred barrows were slaughtered. 1 half of each carcass was hot processed (before chilling) while the other half was cold processed (after chilling). The loin roasts and chops obtained were cooked conventionally or by microwaves. Hot processing produced 2.9% more primal cuts and 1.3% more ham and loin than cold processing. % lean cuts and shoulder did not differ significantly. Curing and smoking shrinkages for hams were not significantly different, but were different for shoulders (hot processed 2.3%, cold processed 2.0%). Total cooking losses were, for hot processed/conventionally cooked, hot processed/microwave cooked, cold processed/conventionally cooked and cold processed/microwave cooked loin chops, respectively, 31.0, 26.0, 33.8 and 31.3%. Warner-Bratzler shear values were higher for hot processed chops, indicating less tenderness. Total cooking losses were 28.2 and 32.1% for hot and cold processed roasts, respectively, and were 29.6% and 30.6% for conventionally and microwave cooked roasts, respectively. Cold processed roasts were more tender than hot processed roasts and conventional cooking gave greater tenderness than microwave cooking. JA

49

Fate of Staphylococcus aureus in beef-soy loaves subjected to procedures used in hospital chill foodservice systems.
Bunch, W. L.; Matthews, M. E.; Marth, E. H.
Journal of Food Science 42 (2) 565-566 (1977)
[7 ref. En] [Dep. of Food Sci., Univ. of Wisconsin, Madison, Wisconsin 53706, USA]

Staph. aureus was inoculated into uncooked mixtures of ground beef and soy protein and survival of the organism was determined during the stages of food handling that would occur in a hospital with a chill foodservice system. Although the initial inoculum was only approx. 5000/g, heating the mixture as loaves in a convection oven at 121°C to an internal temp. of 60°C was not lethal to Staph. aureus. Numbers of Staph. aureus in loaves decreased during holding at 5°C for 24, 48 and 72 h. Numbers of Staph. aureus in the centre of the final product were <3/g after loaves were portioned, held chilled at 5°C for 2 h, and portions heated to 80°C in a microwave oven. IFT

50

Microwave and conventional precooking of hot and cold processed pork loins.
Montgomery, T. H.; Ramsey, C. B.; Lee, R. W.
Journal of Food Science 42 (2) 310-315 (1977)
[22 ref. En] [Anim. Sci. Dep., Texas Tech Univ., Lubbock, Texas 79409, USA]

20 barrows were used to study the effects of hot and cold processing of pork loin chops and roasts precooked by conventional or microwave methods. Cooking time, losses, palatability and histological characteristics were determined. Precooking of hot processed chops appeared unfeasible due to decreased tenderness related to muscle contraction. Precooking of hot processed roasts by conventional roasting appeared feasible because of lower cooking losses and acceptable tenderness as compared to that of cold processed roasts. Microwave precooking of chops and roasts was less desirable than conventional precooking because of increased cooking losses and decreased tenderness. Sarcomere length and fibre diam. were related to muscle tenderness. IFT

51

Preparing foodstuffs for subsequent microwave cooking.
Matves, G.
Australian Patent 474 498 (1976) [En]

Foodstuffs are processed and preserved in a raw or uncooked condition by subjecting them to a pretreatment or conditioning operation, appropriate to its initial moisture content, so as to reduce its moisture content or restrict its moisture loss. The foodstuff is then dry-frozen with liquid N_2 and packed under vacuum in material in which it can subsequently be cooked in a microwave oven. W&Co

52

[Dehydration by microwaves. Evaporation and sublimation under vacuum.]
Archieri, C.
Bios 7/8 (12/1) 10-21 (1976/1977) [9 ref. Fr]
[Inst. de Recherches Appliquees aux Boissons, 120 Avenue Foch, 94003 Creteil, France]

This illustrated review-type article deals with definition, properties and mode of action of microwaves; microwave driers (generators and drying chambers); different methods of microwave freeze-drying; and vacuum microwave evaporation by the Gigavac process, with particular reference to the high quality of its products. Application of the procedures discussed to drying of strawberries, raspberries, mushrooms, coffee, passion-fruit juice and orange juice is described (or briefly mentioned) from the literature. SKK

53

Small hospital keeps the lid on costs by combining FF and microwave ovens.
Anon.
Quick Frozen Foods 38 (7) 42B, 42D (1976)
[En]

Consideration is given to the way in which the 200-bed Community Methodist Hospital in Henderson, Kentucky, can now serve 18 000 meals/month with the same number of chefs formerly used to produce 8000. A food service system has been developed, based on the use of frozen convenience foods and microwave ovens. It has enabled the hospital to provide quality food with min. expense and max. efficiency. The tray assembly line is manned by 3 people who, after checking the menus selected by the patients, assemble the items on the trays. These are then taken to the floor pantries, and placed in the ovens for from 40 s to 1 min. A floor with 60 patients can be served in 1 h. VJG

54

Microwave exposure and flavor evaluation for juice concentrate.
Copson, D. A.
Abstracts of Papers, American Chemical Society 173, AGFD 48 (1977) [En] [Biol. Dep., Univ. of Puerto Rico, Mayaguez, Puerto Rico 00708]

While microwave quanta are nonionizing, intense fields may be conc. by suitable devices. Masers which act as quantum pumps stimulate coherent beams of energy with fields approaching 10^7 V/cm. Another device is the helical director which can concentrate microwaves into intense, local fields suitable for juice exposure where coherence is unnecessary. The mechanism for microwave interaction is mainly rotation and absorptive polarization which increases the juice energy as responsive portions of the fluid work against constraints provided by the viscous forces. A counter-current, low loss helical director system gave quick heating and rapid quenching of the output by the input. The enzymes responsible for

pectin degradation were inactivated while microorganisms were destroyed. Flavour evaluation included a test for difference in a trio of unknowns and preference. No significant lessening of acceptability for the exposed juice over the control was found. AS

55

[Microwave, infra red and contact plate heating for freeze-drying of some vegetable products.]
Aglio, G. dall'; Gherardi, S.; Versitano, A.
Industria Conserve 51 (4) 282-289 (1976) [11 ref. It, de, en, fr] [Sta. Sperimentale per l'Ind. delle Conserve Alimentari, Parma, Italy]

Microwave heating was compared with contact plate and IR heating during freeze-drying of orange juice, persimmon puree and sliced onions, carrots and mushrooms. Freeze-drying rates are shown graphically and analytical values are tabulated for the products. Microwave heating at 60 W reduced the drying time by 60% for persimmon puree, 46% for mushrooms, 44% for carrots, 36% for orange juice and 23% for onions, without appreciable effects on the analytical and organoleptic characteristics of the products immediately after freeze-drying. After 2 months storage some flavour changes were observed in orange juice and persimmon puree. Drying time for sliced vegetables could be halved by using initial microwave heating at 220 W, followed by 60 W. RM

56

Quality factors in beef, pork, and lamb cooked by microwaves.
Korschgen, B. M.; Baldwin, R. E.; Snider, S.
Journal of the American Dietetic Association 69 (6) 635-640 (1976) [18 ref. En] [Dep. of Food Sci. & Nutr., Univ. of Missouri-Columbia, Missouri, USA]

Longissimus muscle of beef and pork and deboned leg of lamb were cooked as follows (internal temp. of 70°C): (i) intermittent energy applicating (3-min cycle) with microwave range operated at 220 V; (ii) intermittent energy application (6-min cycle) with a microwave range operated at 115 V; and (iii) control roasts cooked in a conventional gas oven (163 ± 3°C). A comparison was made of flavour, tenderness, juiciness, cooking times and losses, shear values, and creatine and creatinine contents. Cooking losses were significantly greater for (i) and (ii) than for (iii), but flavour of interior portions of the (i) and (ii) meats were similar to those of (iii). Flavour differences in samples from the edge of slices of lamb and pork and tenderness of lamb appeared to be related to cooking method. For these attributes, (iii) cooked meat was superior. Results for tenderness and juiciness of beef and pork were not consistent. Apart from time-saving aspect of microwave cooking there was no advantage of one method of cooking over another. VJG

57

Microwave cooking and ready meals. (In 'Proceedings of the 6th European Symposium' [see FSTA (1977) 9 10G719].) [Lecture]
Bengtsson, N.; Ohlsson, T.
pp. 72-93 (1975) [24 ref. En, de, fr] [Swedish Inst. for Food Preservation Res., Göteborg, Sweden]

The background and fundamentals of microwave heating, estimation and calculation of temp. rise, the estimation of how product and heating parameters will influence temp. development with time, and the importance of this time-temp. exposure of food to product yield and quality are discussed. The very rapid heating possible using microwaves should allow the heating of ready meals and meal components with less wt. loss and better retention of organoleptic and nutritional quality than in conventional heating, if good control of time-temp. development can be maintained. AL

58

[Dehydration of fruit and fruit juice under vacuum by microwave heating.] (In 'Proceedings of the 6th European Symposium' [see FSTA (1977) 9 10G719].) [Lecture]
Menoret, Y.; Archieri, C.
pp. 48-61 (1975) [7 ref. Fr, en, de] [Inst. de Recherches Appliquees Aux Boissons, 120 Avenue Foch 94003, Creteil, France]

Faster heating with microwaves (2450 MHz) has allowed the development of a continuous vacuum dehydration process for fruit and fruit juice concentrates. A 7.5 kW pilot unit has been designed with a water evaporation rate of 8 kg/h. Whole fruits or fruit extracts are heated at <45°C on a plastics belt conveyor then transferred into a vacuum container. Drying time is about 20 min for concentrates, 1 h for fruits. Conc. orange juice (65° Brix) can be dehydrated directly into a soluble powder with an aroma quality equal to that of samples obtained by freeze-drying. AS

59

Use of microwave oven rapidly determines moisture content of cheese, allows swift corrections at batch stage.
Anon.
Dairy and Ice Cream Field 160 (4) 82B (1977) [En]

A brief description is given of a rapid microwave method which produces a moisture reading in 2.5 min. It involves placing a prepared sample of approx. 10 g on a pyrex Petri dish, covering it with a glass fibre filter paper to prevent spattering, and exposing it on a balance to microwave energy for 2.25 min. The result is read directly in moisture %. The method is considered to be particularly useful in continuous cheesemaking operations, but is also applicable to other dairy products such as butter and ice cream mixes. FL

60

[Process for increasing the life of cheeses, particularly soft cheese with mould.]
Leon, J.; Remars, L.; Tracard, H. Fromageries Bel - La Vache Qui Rit
French Patent Application 2 312 965 (1976) [Fr]

Soft cheeses are prevented from going rancid by microwave treatment. The young and unmatured cheeses are treated with microwaves while in a packaging permeable to those waves so that the mould on the crusty surface is heated but the soft interior is not, or to only ≤35°C. The cheese must be treated within 8 days of packaging. In an example, a cheese of 250 g is exposed for 40 s in an oven of 1500 W. W&Co

61

1976 Microwave Power Symposium. Katholieke Universiteit Leuven, Belgium July 27-30. [Conference proceedings]
Capelle, A. van de; Decareau, R.; Voss, W. A. G. International Microwave Power Institute (Editors)
Journal of Microwave Power 11 (2) 133-216 (1976) [many ref. En] [Katholieke Univ. Leuven, Kardinaal Mercierlaan 94, B-3030 Heverlee, Leuven, Belgium]

Abstracts are given of papers presented at this symposium, including the following concerning food-related applications: Microwave energy control by humidity sensing [in microwave ovens], by P. O. Risman (pp. 177-178); Temperature distribution in microwave oven heating: experiments and computer simulations, by T. Ohlsson (pp. 178-179); Temperature distribution in microwave oven heating. A comparison of mapping methods and influence of sample parameters, by T. Ohlsson (pp. 180-181); Design of a flexible oven for mobile catering, by R. J. W. Constable (p. 181); Microwaves, combined with hot-air and microwave interval switching, by J. H. Bachtold (p. 182); Microwave resonators for vegetable and fruit grading, by M. A. K. Hamid & M. A. Rzepecka (p. 195); Magnetron moding in relation to the design of microwave ovens, by K. Yamaguchi, R. Suzuki & M. Nakano (p. 202); New uses of microwave power in the food industry, by G. Faillon & E. Maloney (pp. 210-211); New high-barrier films which permit microwave heating, by J. L. Hecht & V. C. Haskell (pp. 211-212); and Food sterilization in a microwave pressure retort, by J. P. O'Meara, W. R. Tinga, C. K. Wadsworth & D. F. Farkas (pp. 213-214). A further 3 papers are abstracted separately in FSTA, and are in the author index under International Microwave Power Institute [1976 Symposium]. AJDW

62

1977 Microwave Power Symposium. [Conference proceedings]
International Microwave Power Institute
Journal of Microwave Power 12 (1) 1-60 (1977) [many ref. En]

Abstracts are given of papers presented at this symposium, including the following concerning food-related applications: An historical study of microwave oven developments and their impact on cost, by B. D. Kumpfer (p. 1); A microwave system for hospital food service, by R. Franzese (pp. 4-5); Methods and materials in microwave oven food packaging, by A. E. Colato (pp. 6-7); A new programmable microwave-hot-air oven, by J. H. Bächtold (pp. 7-8); Controlling microwave heating in food, by R. V. Decareau (pp. 9-10); Nutrient retention in microwave heated foods: a review, by B. P. Klein (pp. 10-11); Comparison of energy use in major electrical cooking appliances, by B. Spinti (p. 11); Educating the microwave oven user, by A. Hamernik (p. 12); Survey of food, dish and utensil needs of microwave oven users, by V. Ludvigson (pp. 12-13); Improvements in the design of microwave oven door seals, by K. Ishino, H. Abe & Y. Hashimoto (p. 23); Methods of improving heating uniformity of microwave ovens, by S. C. Kashyap & W. Wyslouzil (pp. 24-25); Microwave dielectric properties of insects and grain kernels, by S. O. Nelson (p. 39); Thawing of beef slabs by microwave energy, by A. Priou, C. Fournet, J. C. Gaillardin, A. Deficis & E. Gimonet (p. 49); and Microwave thawing experiments of food products with surface cooling by means of a cryogenic liquids sprayer, by D. Bialod, M. Jolion & R. le Goff (pp. 59-60). A further 3 papers are abstracted separately in FSTA, and are in the author index under International Microwave Power Institute [1977 Symposium]. AJDW

63

New uses of microwave power in the food industry.
Faillon, G.; Couasnard, C.; Maloney, E. D.
Journal of Microwave Power 12 (1) 79-86 (1977) [2 ref. En] [Thomson-CSF Div. Tubes Electroniques, 38 Rue Vauthier, 92100 Boulogne, France]

A pilot-scale microwave cocoa bean roasting system (throughput 70-120 kg cocoa beans/h) is described. The beans are microwave-roasted as they pass through helical ducts in a rotating drum; roasting time is 5-10 min. Two 5 kW magnetrons are used. Yield is slightly higher than that achieved with conventional roasting units; other advantages of the microwave system include lower roasting temp. and reduced smoke formation. A microwave drying system for egg yolk is also described; egg yolk paste is dried to a powder which may be used in noodles, etc. The microwave-dried product is of superior quality to conventionally-dried products; its reconstitution characteristics are excellent. Substitution of a single 50 kW klystron for 16 5 kW magnetrons in this egg yolk dryer is discussed, with reference to advantages of high-power klystrons. AJDW

64

[Physical principles of the action of microwaves, and the possibility of microwave utilization in thermal processing of foods.]
Zornic, S.; Pajic, M.; Kocovski, T.
Tehnologija Mesa **17** (11) 319-325 (1976) [16 ref. Sh, en] [Jugoslovenski Inst. za Tehnologiju Mesa, Belgrade, Yugoslavia]

A theoretical and detailed description is given of microwave heating, with special reference to food heating. Relevant equations for expressing the energy absorption by the material being heated, and the rate of microwave penetration in foods are presented. The importance of the dielectric constant of foods and the effect of its magnitude on microwave heating are discussed. Possibilities are indicated for the utilization of microwave energy in heat processing of meat, meat products and vegetables, in particular for heating frozen table-ready foods. Application of microwaves for sterilizing foods packaged in plastics bags is shown to be another field of utilization. STI

65

Microwave sterilization of pea flour and pea protein concentrate. [Lecture]
Wyslouzil, W.; Kashyap, S. C.
Journal of Microwave Power **11** (2) 212-213 (1976) [En] [Div. of Electrical Eng., Natural Res. Council of Canada, Ottawa, Ontario, Canada K1A OR8]

Studies on sterilization of pea flour and pea protein concentrate by microwave heating are described. Values determined (at 2450 MHz) for dielectric properties of peas, pea flour and pea protein concentrate respectively were: dielectric constant, 2.5, 2.0 and 1.7; and dielectric loss factor, 0.16, 0.12 and 0.06. Samples of pea protein concentrate were heated in a 3.6 kW microwave applicator for 30, 45, 50, 55 or 65 min.; final temp. and final bacterial counts were, respectively: 56° C and 113 500/g; 76° C and 14 100/g; 84° C and 13 900/g; 86° C and 6500/g; and 99° C and 5700/g. Non-heated control samples had bacterial counts of 144 000/g. The experimental microwave applicator used is described. [See FSTA (1977) 9 11E379.] AJDW

66

Microwave ovens and frozen foods make cents. [Book]
Decareau, R. V. International Microwave Power Institute (Editor)
113pp. (1975) [many ref. En] Edmonton, Alberta, Canada Price $10.00

This publication is Vol. 5 in the Transactions of the International Microwave Power Institute and contains papers given at a 1-day short course at the US Army Natick Development Center, Natick, Massachusetts, on Oct. 23, 1975. Papers were: Introduction, by R. V. Decareau (pp. 1-4); Changing perceptions of food in modern life, by J. A. Koop (pp. 5-19); Basic principles of microwaves, by R. F. Schiffmann (pp. 20-39, 6 ref.); Microwave: capitalize, by V. Ludvigson (pp. 40-43); Nutrient implications of microwave cooking and heating of frozen foods, by C. Y. W. Ang & G. E. Livingston (pp. 44-61, 22 ref.); Microwave cooking utensils, by B. L. Jones (pp. 62-69); Food packaging options for the microwave oven market, by F. B. Shaw (pp. 70-77); Commercial microwave food service applications, by R. V. Decareau (pp. 78-88, 11 ref.); Microwave tempering of frozen foods, by A. Bezanson (pp. 89-100, 6 ref.); and Microwave research at Natick Developments Center, by R. V. Decareau (pp. 101-111, 4 ref.). AL

67

Microwave blanching of peaches.
Avisse, C.; Varoquaux, P.
Journal of Microwave Power **12** (1) 73-77 (1977) [16 ref. En] [Sta. de Tech. des Produits Vegetaux, INRA, 21034 Dijon Cedex, France]

Studies on the potential for microwave blanching of peaches before freezing are described. Peaches of 4 var. (Ambergen, Babygold 6, Dixon and Tuscan) were used. The peaches were heated for 0 (control), 6, 8 or 10 min in a domestic microwave oven (2.45 GHz, 700 W), halved, stoned, deep-frozen in liquid N, packaged in cardboard boxes lined with thermoweldable plastics, stored for 1 month at -18° C, and thawed either at room temp. or in a microwave oven. Data are given for the final temp. reached, residual peroxidase and polyphenoloxidase activity, vol. of juice exuded, and fruit colour and flavour. Both enzymes were almost fully inactivated after microwave heating for 10 min.; var. differed considerably in degree of enzyme inactivation after shorter heating times. Juice exudation decreased with increasing microwave blanching time over the range studied. Microwave blanching reduced browning of the flesh of the fruit; the peel of both blanched and non-blanched fruit underwent brown discoloration. Subsequent peeling would eliminate this defect. Flavour of microwave-blanched samples was superior to that of non-blanched samples. AJDW

68

Microwave thawing of peaches: comparative study of different treatments. [Lecture]
Phan, P. A.
Journal of Microwave Power **12** (1) 2-4 (1977) [4 ref. En] [Lab. de Physiol. des Organes Vegetaux apres Recolte CNRS, Sta. du Froid, 4ter, Route de Gardes 92190 Meudon, France]

Studies were conducted on methods for thawing of Clingstone peaches. Peeled or non-peeled green or mature fruit were frozen at -20° C in an air-blast tunnel, and stored for 6 months at -20° C. They

were then thawed (i) in air at 20° C; (ii) by a 2-step process in air at 20° C then at 4° C; or (iii) in a microwave oven. Quality of the thawed fruit was evaluated by microscopic examination, detn. of the quantity of exudate, detn. of the refractometric coeff. of the exudate, and measurement of colour with a Hunterlab colorimeter. Histograms of results are given. None of the thawing methods caused appreciable cell wall breakage. (i) gave considerably greater exudate vol. than (ii) or (iii); (iii) gave slightly lower exudate vol. than (ii). Exudate vol. from mature fruit was approx. 50% of that from green fruit. Peeling increased exudate loss. (ii) resulted in paler fruit colour than (i) or (iii). It is concluded that (iii) is of considerable potential for thawing of peaches. [See FSTA (1977) 9 11E380.] AJDW

69

Tomato paste dehydration by hot air and microwave energy. [Lecture]
Rzepecka-Stuchley, M. A.; Brygidyr, A. M.; McConnell, M. B.
Journal of Microwave Power 11 (2) 215 (1976)
[En] [Food Sci. Dep., Univ. of Manitoba, Winnipeg, Manitoba, Canada R3T 2N2]

Comparative studies were conducted on foam-mat drying of tomato paste by (i) the conventional hot-air method and (ii) a microwave method. Tomato paste (containing 27% solids) was used in the studies; Myverol 18-100 stabilizer was incorporated. 3 foam layer thicknesses were tested: 3.2, 6.4 and 12.7 mm. In (i), air temp. of 71°, 76.7° and 82° C were studied, at an air flow rate of 350 ft^3/min.; in (ii) the foam was dried by microwave heating at 2450 MHz (various power outputs), with room-temp. air flowing at 400 ft^3/min. The results show that (ii) was 4-6 times faster than (i); product quality was acceptable at higher drying temp. with (ii) than with (i). Effects of foam density, bubble size and layer thickness on the dehydration characteristics are discussed, together with the amount of microwave energy used for evaporation of specified vol. of water under various drying conditions. [See FSTA (1977) 9 11E379.]
AJDW

70

Microwave attenuation by frozen fish.
Kent, M.
Journal of Microwave Power 12 (1) 101-107 (1977) [10 ref. En] [Min. of Agric., Fisheries & Food, Torry Res. Sta., Aberdeen, UK]

Studies on the dielectric properties of frozen cod (Gadus morhua) and haddock (Melanogrammus aeglefinus) are described. Attenuation measurements were conducted on 4 kg blocks at 10 GHz and 35 GHz, and complex permittivity was determined at 10^7 and 10^8 Hz by time domain spectroscopy; studies were conducted on changes in dielectric properties during adiabatic equilibration, and on the temp. dependence of microwave attenuation. Graphs of results are given. The intrinsic attenuation of frozen fish was shown to be linearly dependent on unfrozen water content up to a temp. of approx. -6° C. Provided that total moisture content is known, attenuation measurements provide a means of non-destructive detn. of enthalpy; overall orientation of muscle fibres in frozen blocks of fish is a perturbing influence on attenuation measurements. AJDW

71

Coagulation of fish products prior to canning. [Lecture]
Francois, D.
Journal of Microwave Power 11 (2) 216 (1976)
[En] [IMI-SA Industries Micro-Ondes Internationales, F-78680, Epone, France]

Studies on microwave cooking of fish before canning are described. Laboratory studies on whole and filleted fish showed microwave precooking to give a higher yield, higher dry wt. and higher protein concn. than precooking in water; the higher yield of microwave-cooked samples is attributed to retention of soluble proteins and salts leached out during cooking in water. These results were confirmed in industrial-scale trials with herrings, sardines and mackerel fillets; also, the appearance and taste of the microwave-cooked samples were preferred. Microwave thawing of frozen fish is also briefly considered. [See FSTA (1977) 9 11E379.]
AJDW

72

Temperature, time and yield comparisons of beef loaf portions subjected to microwave heating. [Lecture]
Dahl, C. A.; Matthews, M. E.
Journal of Microwave Power 12 (1) 8-9 (1977)
[En] [Dep. of Food Sci., Coll. of Agric., Univ. of Wisconsin, Madison, Wisconsin 53706, USA]

Studies were conducted on microwave reheating of beef loaf portions (11 cm × 5 cm × 2.5 cm), previously stored for 24 h at 5° C. A total of 40 portions were used in the tests. Data are given for temp. before and after microwave heating, temp. change during heating, heating time, heating rate, and the % yield of the re-heated meat loaf. No consistent relationship between heating rate and yield was observed. A reduction in the variability of quality characteristics after microwave heating is required to provide predictive estimates of final temp. and yield. It is suggested that an instrument to monitor internal temp. during microwave heating should be developed. [See FSTA (1977) 9 11E380.] AJDW

73

[Effect of meat treated with ultra-high frequency energy and infrared-rays on the secretory function of the stomach.]
Kulakova, S. N.; Laktaeva, T. V.
Voprosy Pitaniya No. 4, 24-29 (1977) [10 ref. Ru, en] [Inst. Pitaniya AMN SSSR, Moscow, USSR]

In view of the increasing use of UHF and IR rays for heating and/or processing meat for human consumption, tests were carried out on dogs to determine the effect of non-fat meat samples irradiated with UHF rays at 433 mHz (6-min cycle) or IR rays at 1.3×10^4 W/m^2, or with a combination of the 2, on the animals' gastric secretion. Generally, all 3 treatments increased the level of gastric secretion more than did conventional cooking (boiling or frying). HBr

74

Maintenance of beef tenderness by inhibition of rigor mortis.
Streitel, R. H.; Ockerman, H. W.; Cahill, V. R.
Journal of Food Science 42 (3) 583-585 (1977) [20 ref. En] [Dep. of Anim. Sci., Ohio State Univ., Columbus, Ohio 43210, USA]

3 different methods of affecting meat tenderness by treating pre-rigor muscle were evaluated. The muscle relaxants (phosphate and $MgCl_2$), a glycolytic inhibitor (sodium citrate) and microwave cooking were tested for improvement in post-rigor tenderness. The results indicate that microwave cooking of pre-rigor muscle produced a significant tenderization effect when compared to post-rigor cooking and the magnitude of this difference was $\geq$ 50%. Sodium hexametaphosphate, sodium pyrophosphate-sodium hexametaphosphate and sodium citrate also produced an increase in tenderness when compared with their controls. IFT

75

Comparative heating efficiencies of appliances at reduced atmospheric pressures.
Lorenz, K.; Dilsaver, W.
Lebensmittel-Wissenschaft und -Technologie 10 (3) 135-138 (1977) [6 ref. En] [Dep. of Food Sci. & Nutr., Colorado State Univ., Fort Collins, Colorado 80523, USA]

The effect of altitude on cooking performance with 3 different types of oven was examined in a series of laboratory experiments employing a conventional type of wall oven, a turbo-oven with air circulated at high velocity, and a microwave oven. Tests were performed in a chamber at reduced pressures intended to simulate conditions at 2500 ft (762 m), 5000 ft, 7500 ft (1524 m) and 10 000 ft (3048 m) above sea level. Products tested included ground beef, apples (Rome) potatoes (Burbank), squash (acorn) and split pea soup; initial and final temp. and wt. loss during cooking for prescribed periods were recorded. Although the final temp. diminished with increasing altitude in all cases, products cooked in the turbo-oven reached higher temp. with correspondingly greater moisture losses, than those cooked in a conventional oven. Altitude was also shown to affect final temp. and wt. losses of foods cooked in a microwave oven, even though cooking times were considerably less than those in conventional ovens. Attempts to express the observed changes in terms of relatively simple mathematical equations were not successful, on account of the diversity of composition and cooking times of the products examined. BDH

76

Improvements in or relating to bakers' ovens.
Simon-Vicars Ltd.
British Patent 1 471 016 (1977) [En]

An oven for making biscuits employs a teflon conveyor belt and convection together with passage through an intermediate section employing high frequency dielectric heating. IFT

77

Meeting effluent discharge requirements and water reuse.
Wilson, G. E.; Huang, J. Y. C.
Food Technology 31 (6) 26, 28-31 (1977) [En] [Eutek Inc., 1828 Tribute Road, Sacramento, California 95815, USA]

Following a brief discussion of the implications of the US Federal Water Pollution Control Act Amendments of 1972 (PL 92-500), detailed consideration is given to the development of a cost-effective programme for dealing with carrot processing wastes. The 2 objectives to be accomplished by the programme were: removal of settleable, suspended and colloidal materials from the waste water; and reuse of the reclaimed water in product cleaning operations. The 3-phase programme used in achieving these objectives is described with the aid of photographs, flow diagrams and tabulated performance data, the 3 phases being: evaluation of soil solids removal and water reuse system; pilot evaluation of the system for suspended and colloidal solids removal and water reuse; and design, installation and start-up of the full-scale solids removal and water reuse system. The treatment system developed uses a decayed gradient flocculator/gravity clarifier and coarse media contact filter. The quality of the final filtrate meets discharge requirements and is suitable for reuse in carrot processing operations. JA

78

Microwave conditioning of durum wheat. I. Effects of wide power range on semolina and spaghetti quality.
Doty, N. C.; Baker, C. W.
Journal of Agricultural and Food Chemistry 25 (4) 815-819 (1977) [41 ref. En] [Dep. of Cereal Chem & Tech., North Dakota State Univ., Fargo, North Dakota 58102, USA]

Crosby durum wheat was conditioned with microwave energy at 2450 MHz before experimental milling and processing. Randomly selected duplicate samples were irradiated at 625 W for up to 600 s, in 120-s increments. The temp. of conditioned samples ranged from 22°C (0 s) to 110°C (600 s). Physicochemically important semolina and spaghetti quality parameters were adversely affected after 360 s (+25.9 cal/g) of microwave conditioning. Milling behaviour and physical dough characteristics deteriorated after prolonged irradiation. Most notable among the adverse biochemical effects were increased dough

strength, increased starch damage during milling, increased rate of starch retrogradation, decreased α-amylase activity, decreased β-amylase activity and loss of only 25% of total lipoxygenase activity after 600 s. Spaghetti colour and cooked wt. decreased, while cooking loss and firmness increased. In general, there were minimal effects on overall quality after 240 s (+17.3 cal/g) or less of microwave conditioning. AS

79

Microwave conditioning of durum wheat. II. Optimization of semolina yield and spaghetti quality.

Baker, C. W.; Doty, N. C.

Journal of Agricultural and Food Chemistry 25 (4) 819-822 (1977) [14 ref. En] [Dep. of Cereal Chem & Tech., North Dakota State Univ., Fargo, North Dakota 58102, USA]

Crosby durum wheat was conditioned with microwave energy at 2450 MHz before experimental macromilling to increase semolina yield and spaghetti quality. Randomly selected duplicate samples were irradiated at 625 W for up to 90 s, in 15-s increments. Conditioning parameters were selected on the basis of quality data and grain temp. observed during application of wide ranges of microwave power [see preceding abstr.] and the results of a micromilling study. In the micromilling study, microwave conditioning was performed at 390 W in 2-s increments up to a max. grain temp. of 65°C. Semolina and spaghetti quality parameters of the micromilled samples were not influenced by conditioning time but selectively influenced by level of tempered moisture. Microwave conditioning for 60 s was optimum in the macromilling study. Semolina and semolina + flour yield were increased 1.8 and 2.5 % points, respectively. Spaghetti colour, cooked wt. and cooking loss were not altered by this conditioning treatment, while spaghetti firmness was increased significantly. AS

80

Effect of microwave treatment of pre-soaked paddy, brown and white rice.

Roberts, R. L.

Journal of Food Science 42 (3) 804-806 (1977) [14 ref. En] [USDA W. Regional Res. Lab., Berkeley, California 94710, USA]

The gelatinizing effects of microwave energy on whole grain rice were tested using paddy, brown and milled white rice. Rice at 30-35% moisture showed promising gelatinization results with microwave heating at 1 atm. Products from short and medium grain rice were similar to parboiled rice and had less pasty characteristics. An expected surface gelatinization of whole kernels by the microwave 'self-leveller' effect was not observed. IFT

81

Thermal destruction of microorganisms in meat by microwave and conventional cooking.

Crespo, F. L.; Ockerman, H. W.

Journal of Food Protection 40 (7) 442-444 (1977) [10 ref. En] [Ohio State Univ., Columbus, Ohio 43210, USA]

When heating ground beef to internal temp. of 34°, 61°, and 75°C, high temp. (232 ± 6°C) oven cooking was more effective for bacterial destruction than low temp. (149 ± 6°C) oven cooking. Low temp. oven cooking was more effective than microwave cooking. These differences in microbial destruction rates became significant ($P < 0.05$) when the meat reached the 75°C internal temp. level. AS

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FAB 5

MICROWAVES IN FOOD PROCESSING

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H. BROOKES

ASSISTANT EDITOR

1

Microwave conditioning of hard red spring wheat. I. Effects of wide power range on flour and bread quality.

Doty, N. C.; Baker, C. W.

Cereal Chemistry 54 (4) 717-727 (1977) [38 ref. En] [North Dakota State Univ., Fargo, North Dakota 58102, USA]

Waldron hard red spring wheat was conditioned in a closed system with ⩽450 s of microwave energy (625 W) before experimental Buhler milling and baking. The temp. of conditioned samples ranged from 22°C (0 s) to 105°C (450 s). Analysis of the flour and bread indicated that physicochemically important quality parameters were adversely affected after 270 s (+20.2 cal/g) of microwave conditioning. Most noteworthy among the reduced quality parameters were: decreased extraction, increased ash, increased dough strength, decreased β-amylase activity, increased retrogradation, increased flour viscosity, decreased loaf vol., and decreased external and internal loaf characteristics. Starch damage decreased with ⩽360 s of conditioning. Falling number values indicated that the low initial dextrinogenic activity was essentially unchanged throughout the 450-s time of irradiation. Overall, flour and bread quality were highest after 90 s (+6.7 cal/g) of microwave exposure. AS

2

[Microwawe apparatus for continuous measurement of moisture content.]

Rozycki, M.

Przeglad Zbozowo-Mlynarski 21 (1) 29-31 (1977) [Pl]

A new Polish instrument makes use of microwaves within the limits of 1-100 GHz for measuring moisture content, e.g. of cereals. The difference between the action of the microwaves on dry and moist material is indicative of the material's moisture content. Water content of cereals in a flow is especially easy to measure, and the instrument can record continuously the water content during the drying or steeping processes. STI

3

[Industrial thawing of fish.]

Anon.

Revue de la Conserve Alimentation Moderne No. 51, 64-65 (1977) [Fr]

The Gigatron microwave heating tunnel for thawing out blocks of frozen fish (whole or fillets) is described. This can be used for all types of fish (mackerel, whiting, sprats, sardines, etc.) irrespective of size or shape, and ensures heat penetration to the centre with only a brief heating time of 10-15 min. Microwave tunnels can also be used for subsequent heating/cooking processes, leading to a combined thawing-cooking-packaging unit. Its major advantage is the increased gain in wt. of > 10% for many fish var. by microwave cooking compared with cooking in water. With whiting fillets gains were recorded of 15% in total wt. and 15% in protein. Fillets remain flat, and fish skin remains completely undamaged by microwave heating and attractive in appearance, but is easily removed if required without a separate machine e.g. for mackerel fillets. For a combined thawing-cooking unit, a 40 kW microwave installation will handle 1 t fish/h. ELC

4

Rapid determination of milk solids by microwave heater and electrobalance.

Hamada, H.; Yoshino, M.; Shiga, K.; Takahashi, Y.; Nagai, A.; Suga, N.

Journal of Dairy Science 60 (9) 1363-1367 (1977) [10 ref. En] [Dep. of Anim. Products, Nat. Inst. of Anim. Ind., Aoba-cho, Chiba City, Japan]

A new instrument consisting of a microwave heater and an electrobalance was developed and tested for precision and accuracy against a gravimetric reference method for determining milk TS. Linear regression of % milk TS by the new method on those by the gravimetric method ($Y = 1.014X - 0.160$) was obtained and the S.d. from regression was 0.03% milk TS. Precision and accuracy of this new method was excellent; the new instrument is faster and easier to operate than an official method such as AOAC Method 1 for milk TS. AS

5

Microwaves cook bacon.

Anon.

Food Engineering International 2 (8) 38-39 (1977) [En, de, fr, es]

2 systems involving microwave heating are described for the pre-cooking of bacon, mainly for the institutional catering and restaurant trade. One system involves cooking with microwaves and the use of hot air to remove moisture. This system is simple and has low capital costs. The other system involves initial heating of the bacon with steam, as microwave generation of heat is inefficient at low temp.; this removes most of the fat and moisture trapped in the fat, hot air then removes more water, and microwave cooking completes the process. The low cooking temp. and short exposure to these temp. are stated to reduce nitrosamine formation in the precooked product; fat stability and colour are better than with conventional pre-cooking processes, and more volatiles are retained, giving better aroma and flavour. The degree of pre-cooking is higher than with conventional pre-cooking, thereby speeding up, and reducing the fat loss in, final cooking. DIH

6

[Properties of grilled pork lumps processed by ultra-high frequency (UHF) waves.]

Tkachenko, L. F.; Belova, T. S.; Lerima, I. V.; Nakonechnyi, N. S.

Tovarovedenie 9, 58-61 (1976) [7 ref. Ru]

'Karbonady' (grilled, slightly salted pork lumps)

were prepared by the traditional technique (involving grilling in a rotary oven at 120-170°C for 1.5-2 h) and by a multistage UHF treatment in a Slavyanka oven (involving UHF radiation for 4 × 2 min with 5 min holding between each stage, giving a 23-min total processing time). UHF treatment had no detrimental effect on the amino acid composition in comparison with the traditional technique; there were slight increases in retention of asparagine, glycine and cystine and a slight reduction in that of alanine. The situation was similar with regard to the overall fatty acid composition; retention was slightly higher for stearic, oleic and linolenic acids and slightly lower for palmitic acid. UHF treatment improved the quality of the fat (peroxide value, I number and extinction being slightly less than with the traditional treatment). HBr

7

Effect of conventional and microwave heating on Pseudomonas putrefaciens, Streptococcus faecalis and Lactobacillus plantarum in meat tissue.
Crespo, F. L.; Ockerman, H. W.; Irvin, K. M.
Journal of Food Protection 40 (9) 588-591 (1977) [24 ref. En] [Anim. Sci. Dep., Ohio State Univ., Columbus, Ohio 43210, USA]

Conventional cooking in an oven at 176 ± 6°C proved to be more destructive than microwave cooking when individual strains of P. putrefaciens, L. plantarum, and S. faecalis were inoculated and grown in aseptically obtained meat tissue and then heated and compared at similar final internal temp. P. putrefaciens was the most heat sensitive microorganism in both cooking techniques. S. faecalis was the most heat resistant strain when cooked by conventional means but L. plantarum proved to be the most resistant when heat was applied by microwave energy. AS

8

How processing with microwave heat affects food qualities.
Smith, F. J.
Food Product Development 11 (1) 60, 62, 78 (1977) [En] [Microdry Corp., San Ramon, California, USA]

Consideration is given to the following aspects of microwave heating: effect on product infestation; effect on colour, flavour and density of food; time saving advantages; use in commercial precooking of meats; use in tempering frozen food blocks; and its use in proofing and frying of doughnuts. VJG

9

[Changes in the colour (and other quality factors) of pasta during drying.]
Laignelet, B.
Tecnica Molitoria 28 (11) 123-127 (1977) [26 ref. It]

See FSTA (1977) 9 5M566.

10

Microwave technique for rapid determination of moisture in cheese.
Pieper, H.; Stuart, J. A., Jr.; Renwick, W. R.
Journal of the Association of Official Analytical Chemists 60 (6) 1392-1396 (1977) [En] [Pauly Cheese Co., Green Bay, Wisconsin 54302, USA]

Microwave drying of cheese permits rapid moisture detn. in 2.25 min. For uniformity, each sample was prepared according to AOAC method 16.216. A special microwave unit was designed for this experiment which used an internal balance, a re-circulating water system, and a variable power control for adjusting microwave intensity. Approx. 10 g prepared sample was placed on a Pyrex Petri dish and covered with a piece of glass fibre filter paper to prevent spattering. The sample was then placed on the internal balance and exposed to microwave energy for 2.25 min at a power setting of 74 (max. power is 78). At the end of the test cycle, the result was read directly in % moisture. The results obtained by this method compare favourably with existing AOAC methods, with improved repeatability and reproducibility. The method has been adopted as official first action. AS

11

Microwaves for the meat industry.
Nott, B.
Food Processing Industry 46 (548) 18, 20 (1977) [En] [ABR Food Machinery Ltd., Denbigh Rd., Bletchley, Milton Keynes, Bucks., UK]

Timportant developments pioneered by ABR Food Machinery Ltd. are discussed. 2 are dealt with in detail, namely, tempering of blocks of meat and other products, and secondly, a new microwave cooker. The third microwave development, an oil/microwave chicken cooker, is briefly mentioned. VJG

12

Extending shelf-life of fresh soybean curds by in-package microwave treatments.
Wu, M. T.; Salunkhe, D. K.
Journal of Food Science 42 (6) 1448-1450 (1977) [10 ref. En] [Dep. of Nutr. & Food Sci., Utah State Univ., Logan, Utah 84322, USA]

Soybean curds are very perishable. The shelf-life of fresh soybean curds varied with storage temp. In-package microwave heating treatment of fresh soybean curds effectively extended shelf-life. Soybean curds pretreated with microwave heating to 65°, 80° and 95°C have shelf-life at 4.5°C of 16, 21 and 27 days, resp., vs. 7 days for the control. Decrease in pH, and increases in titratable acidity and viable counts in the soaking water accompanied decreases in quality of soybean curds. IFT

13

Characterization and drying of tomato paste foam by hot air and microwave energy.
Brygidyr, A. M.; Rzepecka, M. A.; McConnell, M. B.
Canadian Institute of Food Science and Technology Journal **10** (4) 313-319 (1977) [19 ref. En, fr] [Dep. of Food Sci., Univ. of Manitoba, Winnipeg, Manitoba R3T 2N2, Canada]

The formulation of stable tomato paste foams and the effect of characteristics (e.g. foam thickness, density and bubble size) on the drying rates using hot air and microwave energy were investigated. Air injected foams were produced from commercial tomato paste (27% solids) and mono- and diglyceride stabilizer. The foams were dried by hot air (76.7° C) or microwave energy at a frequency of 2450 MHz at various power levels. Excellent drying characteristics were obtained for foams of density 0.38 g/cm^3 and corresponding bubble size index of about 83 µm and containing 1% stabilizer. Both hot air and microwave energy dehydration yielded quality products, but dehydration rates were much greater for the microwave power method (approx. 4-8 times, depending on the power level used). AS

14

Effect of baking methods on the fatty acid composition of potatoes.
Maga, J. A.; Twomey, J. A.; Cohen, M.
Journal of Food Science **42** (6) 1669-1670 (1977) [12 ref. En] [Dep. of Food Sci. & Nutr., Colorado State Univ., Fort Collins, Colorado 80523, USA]

Only minor differences in overall relative fatty acid composition were noted among 4 var. of potatoes baked by microwave and conventional methods. However, the relative % total unsaturated fatty acids were consistently lower in the microwave products as compared to conventionally baked potatoes, regardless of var. (72.5-75.2 vs. 75.8-77.5%). In addition, the relative % trans fatty acids was 2.5-4 times higher in the microwave process compared to the same var. baked conventionally. IFT

15

[Importance of microwave ovens for the dairy industry and sales of milk products.] Die Bedeutung der Mikrowellen-Kochgeräte für die Milchwirtschaft und den Absatz von Milchprodukten.
Schulz, M. E.
Deutsche Molkerei-Zeitung **99** (1) 13-17, 20, 23 (1978) [De]

The author deals with various aspects of the use of microwave ovens (legal regulations, disadvantages, ovens and suitable cooking vessels, operation of ovens, advantages) and gives examples of fast microwave heating or cooking of dishes with added milk products (porridge, bread with cheese, cheeseburger, buttermilk dishes, toasted bread with cheese). FL

16

[The Bach Multiple-frequency method for prolongation of the keeping quality of cultured milk products.] Das Bach'sche Mehrfrequenz-Verfahren zur Haltbarkeitsverlängerung von sauren Milchprodukten.
Reuter, H.
Molkerei-Zeitung Welt der Milch **31** (39) 1278-1280 (1977) [2 ref. De] [Inst. für Verfahrenstech. der Bundesanstalt für Milchforschung, Kiel, Federal Republic of Germany]

The Bach method [see FSTA (1978) **10** 4P572] is based on 2-stage rapid dielectric heating of yoghurt contained in sealed plastics cups. The first stage utilizes horizontal high-penetration relatively low-frequency microwaves during passage of the cups through a water bath; the second stage utilizes vertically downwards directed low-penetration high-frequency waves, a treatment needed to supplement the preceding heating in yoghurt-air interfacial areas. The homogeneity and consistency of yoghurt ensure uniform heating to within at least ± 2° C. Pasteurization by microwaves improves the shelf life of the product, reduces risk of injury thereto and eliminates the need for cooling systems. The additional cost (DM 0.01/cup) is covered by the increased shelf life. GTP

17

[Multiple-frequency method - Bach system - for the treatment of set milk products to prolong their shelf-life.] Mehrfrequenzverfahren - System Bach - eine neue Technologie zur Haltbarkeitsverlängerung stichfester Milchprodukte.
Anon.
Deutsche Molkerei-Zeitung **98** (43) 1370, 1372-1373 (1977) [De]

The use of the Bach system [see FSTA (1978) **10** 4P572] for the treatment of yoghurt is briefly described and its advantages are outlined. FL

18

Pasteurisation of sour milk products using microwaves.
Hansen, R.
Nordeuropaeisk Mejeri-Tidsskrift **43** (9) 316-321 (1977) [En, Da, De]

The article deals briefly with the use of a multiple-frequency unit for treating packaged yoghurt at a Karlsruhe dairy plant. [See also preceding abstr.] FL

19

Cooking with microwaves. [Booklet]
Tinga, W. R. (Editor)
Ed. 2, 70pp. (1976) [many ref. En] Box 1556, Edmonton, Alberta, Canada T5J 2N7; International Microwave Power Institute. Price: $7.50 IMPI members & $10.00 non-members and libraries

This publication, Vol. 6 (Edition 2) of the Transactions of the International Microwave Power Institute, contains papers presented at a 1-day short course in Edmonton, Alberta, Canada on March 27, 1976. Papers are: Microwave ovens - history and future, by W. R. Tinga (pp. 1-9, 7 ref.); Basic principles of microwaves, by R. F. Schiffmann (pp. 11-28, 6 ref.); Microwave safety regulations and equipment maintenance -an illustrated discussion of IMPI policy statements, by W. A. G. Voss (pp. 29-38, 11 ref.); Consumer microwave oven features, by E. Harwood (pp. 39-43); Microwaves and nutrition, by R. V. Decareau (pp. 45-57, 13 ref.); Microwave cooking utensils and food packaging, by W. Sanford (pp. 59-68); and Microwave cookbooks (pp. 69-70). AL

20

The relationship of microwave ovens to frozen food packaging.
Layton, S. F.
Quick Frozen Foods 39 (10) 66, 68-69, 79 (1977) [En]

Consideration is given to the growing use of home microwave ovens throughout the US and to the opportunities this gives to the frozen food packer. A brief outline is given of the basic elements of microwave units, the suitability of packaging materials for microwave cooking, and the advantages of microwave cooking. VJG

21

The microwave recipe book. [Book]
Napleton, L.
vii + 208pp. ISBN 7198-2624-1 (1977) [En]
London, UK; Northwood Publications Ltd. Price £6.25

This book gives ingredients, methods and cooking times for over 200 tested recipes for all occasions. The recipes cover a wide choice of first courses, main dishes and their vegetable accompaniments, as well as sweets and puddings and hot drinks. There are 2 introductory chapters: Preparing food for microwave heating (pp. 3-9); and Putting in a microwave oven (pp. 10-14). The recipes cover 3 main sections: Preparing and serving hand snacks and fork meals (pp. 15-70); Large volume central kitchen recipes (pp. 71-126); and Individual fast meals (pp. 128-202). The final section on prepared fast food gives recipes for: Soups, sauces, beverages, wine and ale (pp. 128-138); Seafoods (pp. 139-160); Meat and poultry (pp. 161-179); Vegetables (pp. 180-186); and Prepared meals (pp. 187-202). VJG

22

[Method for wine clarification.]
Shikhaliev, S. S.; Ismailov, E. Sh.; Muradov, M. S.; Aminov, D. S.
Izvestiya Vysshikh Uchebnykh Zavedenii, Pishchevaya Tekhnologiya No. 5, 154-157 (1977) [6 ref. Ru] [Dagestanskii Politekh. Inst., USSR]

The method involves successive treatment of the wine with a high-frequency magnetic field, followed by cooling. Clarification was intensified at 500-1000 MHz and 10-15 mW/cm^2 for 5-30 min due to a greater coagulation of protein colloidal non-equilibrium fractions, which thereby enhanced the stability of the wine during storage. The best effect was obtained when 30-50 mW/cm^2 was applied for 5-10 min. The combination of microwaves and cooling left the organoleptic and physico-chemical properties intact during 6 months storage. STI

23

[Microwave baking method.] Mikrowellen - Backverfahren.
Schiffmann, R. F.; Mirman, A. H.; Grillo, R. J. (Deutsche ITT Industries GmbH)
German Federal Republic Patent Application 2 726 373 (1978) [De]

In microwave ovens for baking bread etc. supported on metal trays, the bread is baked at 204-214°C for 3-12 min whilst being simultaneously subjected to microwaves having a frequency of 915 or 2350 MHz. By combining conventional heating with microwave heating, energy requirements are reduced and output is increased. W&Co

24

What a food technologist found lacking in microwave ovens.
Katz, M. H.
Food Product Development 11 (9) 48, 50, 54 (1977) [En] [Pillsbury Co., R & D Lab., Minneapolis, Minnesota, USA]

A study of available microwave ovens has shown that it is impossible to try to equate power settings on different models. This makes it virtually impossible to guide consumers with simple instructions for microwave oven food preparation. A comparison is made of power ratings for each oven setting. It is concluded from the study that a food technologist would require microwave ovens to have the following: standard method of rating wattage power of ovens; designated scale of cooking settings expressed as watts of power or scaled as % of total oven power with a clear definition of total power rating; improved defrost cycles to facilitate defrosting a wider var. of sizes and types of frozen foods without overcooking or dehydrating during the defrost cycle; and more uniform energy distribution patterns for cooking and defrosting in microwave ovens. VJG

25

Biological determination of the quality of meat products processed by microwave heating. [Lecture]
Belitskii, B. I.; Zharinov, A. I.; Lerina, I. V.; Pedenko, A. I.; Rogov, I. A.; Tkachenko, L. F.
Proceedings of the European Meeting of Meat Research Workers No. 23, E2:1-E2:17 (1977) [9 ref. En, Ru] [Moskovskii Tekh. Inst. Myasnoi i

Molochnoi Promyshlennosti, Moscow, USSR]

The quality of meat products heated in a microwave field was evaluated. Previous information indicating high nutritional value of products processed by this method was confirmed on the basis of amino acid contents in the products investigated and protein, fat, sugar and mineral metabolism in tested animals. The experiments showed also that no changes occurred in the liver or reproductive functions of white rats fed for a long period on microwave-heated products. The results may serve as a physiological basis for the introduction of microwave heating on a practical scale. [See FSTA (1978) 10 8S1048.] STI

26

The nutritional and biological value of foods containing meat products processed using electrophysical methods. [Lecture]

Kraiko, E. A.; Kulakova, S. N.; Laktaeva, T. V.; Nemenova, Yu. M.; Popova, A. V.; Yasyreva, V. A.

Proceedings of the European Meeting of Meat Research Workers No. 23, E12:1-E12:14 (1977) [En Ru] [Inst. Pitaniya AMN SSSR, Moscow, USSR]

The nutritive value of meat products, comminuted meat products and poultry meat products manufactured using the common methods (cooking in water, frying) and electrophysical methods (microwave or IR heating) was judged on the basis of sensory, microbiological and physiological characteristics. No substantial effects of the electrophysical methods on chemical composition were found. The effect of microwave heating on saprophytes was equal to the effect of common heating methods; spore-forming microorganisms required more intensive heating methods. Tests using isolated dog stomachs showed that feeding microwave-heated meat resulted in a more pronounced reaction of stomach in comparison with commonly cooked meat. The stomach exhibited, particularly in the initial stage, a more intense secretion. A similar effect was observed when meat processed by intense IR radiation was fed. Meat processed using the combination of microwave and IR heating caused similarly increased secretion. [See FSTA (1978) 10 8S1048.] STI

27

[Effect of heating rate on the biological value of muscle protein in horsemeat.] [Lecture]

Zharinov, A. I.; Mangataeva, L. M.; Rogov, I. A.; Yasyreva, V. A.

Proceedings of the European Meeting of Meat Research Workers No. 23, H3:1-H3:17 (1977) [7 ref. Ru, Fr] [Moskovskii Tekh. Inst. Myasnoi i Molochnoi Promyshlennosti, Moscow, USSR]

The effect of heating rate on the amino acids composition and digestibility of muscle proteins of horsemeat heated by microwaves (frequency of 2450 MHz) were studied in comparison with conventional heating. No radical differences were found in the composition of the horsemeat proteins' amino acids attributable to the microwaves. Increased heating rate was conducive to a higher level of enzymic hydrolysis of the proteins, regardless of whether the meat were subjected to microwave or conventional heating. [See FSTA (1978) 10 8S1048.] STI

28

Microwave oven usage and ownership investigated in consumer study.

Murray, B. K.

Food Product Development 11 (10) 72-76 (1977) [En]

This study was carried out in 2 phases: the first involved sending 30 000 questionnaires to a cross-section of female heads-of-household (± own a microwave oven, did they intend to purchase one in the next 12 months, and how they use it); and the second phase involved telephone interviews of a random subsample of 500 microwave oven owners. The following aspects of the survey are discussed: demographic profile of microwave oven owners; microwave oven purchase; use frequency and occasion; type of food prepared; impact on frozens; changes brought by microwaves; and ownership satisfactions. Suggested guidelines are presented for food processors when developing new products and packages adaptable for the microwave oven as well as for conventional oven usage. VJG

29

Methods for improving heating uniformity of microwave ovens.

Kashyap, S. C.; Wyslouzil, W.

Journal of Microwave Power 12 (3) 223-230 (1977) [7 ref. En] [Div. of Electrical Engineering, Nat. Res. Council of Canada, Ottawa, Ontario, K1A 0R8, Canada]

2 methods for improving the heating uniformity of microwave ovens are described. The first method proposes a multi-slot waveguide feed and a stirrer system which effectively varies the location of the source of heat during the heating period. The multi-slot waveguide feed was designed to provide a uniform energy distribution and low reflection coeff., and is achieved if normalized impedance of each slot is as close to 0.25 (1/number of slots) as possible. The stirrer effectively blocks radiation from 2 alternative slots for a fraction of the heating period and the other 2 slots for another fraction of the heating period. The improved feed was shown, by use of heating patterns, to give better uniformity of heating than the conventional feed. The second method involves sweeping the source frequency over a certain range, with the possibility of eliminating the field stirrer. A 30 kW klystron tube fed by a swept frequency signal generator without a stirrer was used. Results of heating patterns showed an improvement in the distribution of heat using the new feed, with the frequency swept over 2450 ± 12 MHz, and the stirrer removed. However this method as yet is not economical to use. SP

30

A preliminary study of microwave monitoring of moisture content in wheat.
Kraszewski, A.; Kulinski, S.; Stosio, Z.
Journal of Microwave Power 12 (3) 241-252 (1977) [21 ref. En] [Wilmer Instruments, Inst. of Physics, Polish Academy of Sci., Zielna 39, 00-108 Warsaw, Poland]

Grain samples of 3 var. of wheat, Siberian and Polish (soft spring wheats) and Canadian (hard winter wheat), stored in silo conditions for at least 4 months during winter 1974-1975 were used for electrical measurements using microwave moisture meters. A 4th var., Grana (soft winter wheat), was divided into 4 parts, one was measured 16 h after harvest, and the remainder held in glass jars at 20° C and measured 4, 12 and 24 days after harvest for post-harvest maturation effects on electrical parameters of grain. All samples of grain were sealed in glass jars and conditioned at 5° C after water was added. The time between tempering or drying and electrical measurements was usually 10 days. Results were for Siberian, Canadian and Polish, resp., moisture content 15.2, 18.4 and 21.5%, test wt. bulk density (mean value) 0.705, 0.685 and 0.638 g/cm^3, and bulk density after 90 s vibration (mean value) 0.785, 0.764 and 0.721 g/cm^3. Graphs, e.g. for attenuation vs. density for various moisture contents of Grana wheat and phase shift introduced by wheat samples of various moisture contents as a function of (Grana) wheat density, are presented. It was concluded that microwave techniques and methods may be equally useful in solving problems arising in continuous moisture content measurement in grain during its drying, storage and processing at silos as under mill conditions. SP

31

Acceleration of lipid oxidation in frozen mackerel fillet by pretreatment with microwave heating.
Ke, P. J.; Linke, B. A.; Ackman, R. G.
Journal of Food Science 43 (1) 38-40 (1978) [20 ref. En] [Dep. of Fisheries, Halifax Lab., 1707 Lower Water Street, Halifax, Nova Scotia B3J 2R3, Canada]

Fresh mackerel fillets with skin on were pretreated, before frozen storage at -15° C, by microwave heating at 2450 MHz for 5, 10 and 20 s. During 6 months, the lipids of the skin and meat of the fillets were separately examined for quality variations by chemical methods, e.g. thiobarbituric acid (TBA), peroxide value (POV) and free fatty acid content (FFA). Pro-oxidant effects on lipids in mackerel fillets pretreated for 20 s were shown by an increase of TBA molar value of 200% and 100% in the skin and meats, resp., after 6 wk of frozen storage at -15° C. In fillets stored for 6 months, the rate of POV increase in the pretreated sample was twice that in the control. According to the 'rancidity indexes for mackerel' quality evaluation system, frozen storage life of mackerel fillets pretreated with microwave heating decreased proportionately with pretreatment time. Loss of storage life was as much as 60% (from 16 to 7 wk) compared with control samples. It is suggested that the promotion of lipid oxidation in fish pretreated with microwave energy should be considered as a particularly important factor affecting quality during frozen preservation. IFT

32

Effects of breed, sex, age, feeding method and muscle on myofiber characteristics and meat palatability.
Johnston, D. M.
Dissertation Abstracts International, B 38 (2) 426: Order No. 77-15951, 190pp. (1977) [En] [Univ. of Kentucky, Lexington, Kentucky 40506, USA]

Lambs that differed in slaughter wt. (41 vs. 50 kg), sex and feeding method, cattle that differed in sex, breed (Angus, ½ Angus, ¼ Angus) and feeding method, and cattle that differed in breed (Angus vs. Simmental cross steers) and feeding method were studied. Myofibril characteristics and taste panel assessments of cooked longissimus muscle steaks were compared. Effects of breed, wt. and sex on longissimus histological traits were minimal for all animals; increased energy levels in the feed caused decreases in αR fibres and increases in αW fibres but had no apparent effect on fibre type diam. Angus steers had less βR fibres and more αR and αW fibres than did Simmental cross steers in biceps femoris and semitendinosus muscles. βR diam. was slightly larger than αR diam. but smaller than αW diam. for all muscles except lamb longissimus, where βR diam. was the largest of the 3 fibre types. Microwave cooked steaks were less juicy and tender than conventionally cooked steaks, but were still acceptable. A breed vs. sex interaction was noticed; as degree of Angus blood decreased, longissimus tenderness increased in steers and decreased in heifers. Younger weaned groups had significantly higher meat quality than did groups kept on grass for about 1 yr. Of the myofibril characteristics, fibre type diam. gave the highest correlations with taste panel scores. Fibre diam. accounted for approx. 20% of the variation in panel tenderness and Instron shear values. βR fibre diam. usually had the highest correlations with carcass characteristics, accounting for 20–40% of variation in carcass wt., marbling score, ribeye area and fat and moisture contents of the muscles studied. Longissimus muscle fibre characteristics in general were more highly correlated with carcass characteristics than values from the 3 round muscles. DIH

33

Sensory properties of the aroma of beef cooked conventionally and by microwave radiation.
MacLeod, G.; Coppock, B. M.
Journal of Food Science 43 (1) 145-151, 161 (1978) [25 ref. En] [Dep. of Food Sci. & Nutr., Queen Elizabeth Coll., Campden Hill Road, London W8 7AH, UK]

Sensory properties of the aroma of cooked beef were analysed using an odour quality assessment technique based on, though not identical with, that of Persson et al. [FSTA (1973) 5 8S1033]. Detailed odour descriptions were obtained for beef samples cooked conventionally and by microwave radiation for different periods of time. Several differences in aroma characteristics were observed. In general, odour qualities rated highly for the aroma of microwave-cooked beef were shown to be either associated with 'meaty boiled' aroma or else to have negative correlation with the quality 'meaty roast'. IFT

34

Optimal modes of operation for microwave freeze drying of food.
Ang, T. K.; Ford, J. D.; Pei, D. C. T.
Journal of Food Science 43 (2) 648-649 (1978) [8 ref. En] [Dep. of Chem. Eng., Univ. of Waterloo, Waterloo, Ontario, Canada]

In freeze-drying, the quality of the resulting product often determines the attractiveness of the drying process. Therefore, the temp. profiles within the material are as important as the total drying time required. For microwave assisted freeze-drying, it was indicated both experimentally and in theoretical analysis that the max. applicable constant field strength for beef cubes is 130 V/cm. Beyond this point melting of the ice core and/or overheating in the dried layer will occur. However, the drying time can be further reduced by 20% if a simple preprogrammed stepwise adjustment of the applied field strength is introduced. IFT

35

Cooking and heating with hot air. [Lecture]
Smith, D. P.
Activities Report 30 (1) 97-104 (1978) [En] [Associated Food Equipment Co., Dallas, Texas, USA]

A brief historical survey of oven development is followed by an analysis of the heat transfer limitations of convection heating and the development of a directed hot air system, named Jet Sweep. An example compares the advantages of the latter system over hot oven baking of pizza, e.g. reduced baking time and temp., improved quality and uniformity of baked crust. The combination of Jet Sweep heating and microwave heating has been successfully applied to baking refrigerated biscuits, and when combined with an electronic processor for unsupervised meal heating. [See FSTA (1978) 10 10G606.] AL

36

[Effect of microwave heating on food quality.]
Potacel, J.
Vyziva Lidu 33 (2) 18-19 (1978) [Cs] [IHE, Prague, Czechoslovakia]

Experiments were carried out using a Czechoslovak MGS 06 microwave oven of 600-W output (M). In cooking of various meat dishes, wt. losses ranged from 10 to 28% in cooking times of 3-7 min, except for beef slices, for which losses were 43 and 47% resp. in cooking for 8 and 20 min. For fish fillets, losses were 6-10% in cooking for 4-10 min. Losses in conventional cooking (C) for a number of meat dishes were 30-38%. Losses of thiamin and riboflavin in M stewing of beef were 10 and 4% resp. vs. 15.5 and 4% in C. For stewed pork, losses were resp. 16 and 6% for M vs. 24 and 13% for C. For cooked potatoes losses of ascorbic acid in M and C were resp. 6 and 24%; and for cooked cabbage, they were 55 and 63% resp. Losses of thiamin, riboflavin and ascorbic acid in convection, microwave, IR and water-bath defrosting and heating tabulated for cauliflower soup, strawberry dumplings, stewed cabbage, beef goulash, potato soup, and pork dishes include resp. the following overall mean values in the order of heat treatment stated: 17.1, 10.2 and 20.4%; 8.5, 7.8 and 17.0%; 11.6, 14.4 and 12.3%; and 9.2, 6.3 and 19.8%. SKK

37

[High-frequency baking - present aspects.] Backen mit Hochfrequenz - aus der Sicht der Gegenwart.
Seiler, K.
International Review for Sugar and Confectionery 31 (3) 100, 109-113 (1978) [8 ref. De] [Bundesforschungsanstalt für Getreide & Kartoffelverarbeitung, 4930 Detmold, Federal Republic of Germany]

Aspects discussed include: practical aspects of the utilization of electromagnetic radiation; basic principles of microwave ovens; the design and characteristics of microwave ovens for baking of yeast-raised products; combined microwave/IR baking; and advantages of microwave baking (better aroma retention, lower nutrient losses, greater uniformity, relatively low space requirements). Costs of microwave and conventional ovens are briefly considered. AJDW

38

Investigations of a rapid method for meat tenderness evaluation using microwave cookery.
Hostetler, R. L.; Dutson, T. R.
Journal of Food Science 43 (2) 304-306 (1978) [9 ref. En] [Meats & Meat Chem. Section, Dep. of Animal Sci., Texas Agric. Exp. Sta., Texas A&M Univ., College Station, Texas 77843, USA]

In an effort to reduce the time spent in making objective measurements of meat tenderness, 1.2 × 1.2 × >2.0 cm long strips of longissimus and semimembranosus muscle were cooked in a microwave oven and sheared with a Warner-Bratzler shear device without further preparation. Shear force values thus obtained correlated significantly with shear force and sensory panel scores obtained on broiled steaks from the same muscles. The mean shear force values were higher for the microwave strips than for the broiled steaks but the s.d. for shear force were similar for both methods of preparation. These results indicate the

feasibility of using microwave cooking to reduce the time required for meat tenderness evaluations. IFT

39

A non contact temperature monitor for the automatic control of microwave ovens.
Bosisio, R. G.; Dallaire, R.; Phromothansy, P.
Journal of Microwave Power 12 (4) 309-317 (1977) [6 ref. En] [Dep. de Genie Electrique, Ecole Polytech. de Montreal, BP 6079 Montreal, Quebec, Canada]

A Toshiba model EBT-600 microwave oven was modified to continuously monitor the effective dielectric temp. of the work load by non contact sensing means. The proposed method of measurement can be used to automatically adjust the rate of temp. rise by controlling the microwave power level, the duty cycle and heating time. Such an automatic control can be useful to improve the uniformity of cooking from sample to sample, and also to prevent the formation of "hot spots" in materials for which the dielectric loss factor increases rapidly with temp. The method and equipment used are described, and measurements on food products are presented. This new method of measurements can be used with any multi-mode microwave oven. In addition the method of measurement can also be used to measure the complex dielectric constant of materials in the presence of microwave power radiation. AS

40

A durable microwave oven door.
Bucksbaum, A. M.
Journal of Microwave Power 12 (4) 293-299 (1977) [3 ref. En] [Amana Refrigeration, Inc., Amana, Iowa 52204, USA]

The safety was investigated of microwave oven models RR-7 and RR-9 manufactured by Amana Refrigeration, Inc., fitted with a quarter wavelength door choke design (illustrated) which provides an electrically tuned circuit about the perimeter of the door, which tunes out the escape of microwave energy from the oven. The ovens were tested by forcing objects in the door gap, seal and window, dropping the oven on a concrete floor and applying the forces of a weighted axe or steel ball to the door seal. After these various treatments leakage from the ovens was not more than 5 m W/cm^2, therefore within the specified limits for leakage before a warning label is required. SP

41

Applications of microwave heating to freeze drying: perspective. [Lecture]
Pettre, R. P.; Arsem, H. B.; Ma, Y. H.
AIChE Symposium Series 73 (163) 131-133 (1977) [12 ref. En] [Dep. of Chem. Eng., Worcester Polytech. Inst., Worcester, Massachusetts, USA]

Microwave heating in freeze-dryers allows a 3- to 13-fold reduction in time required for freeze-drying, but the costs of conversion and development are often considered to outweigh other savings in processing costs. Economic attractiveness of microwaves has improved recently due to the higher relative cost of steam heating, improved life expectancy of microwave generator tubes, and better generator efficiency. Technical limitations are not imposed by corona discharge, which occurs at a greater electric field strength (400 V/cm) than that required to achieve 2-3 h drying times (200 V/cm). The min. drying time is limited by melt-back or overheating. Other problems are with non-uniform heating due to non-homogeneous distribution of microwave energy and impedance mismatch due to the variable nature of the load, i.e. a foodstuff. However, it is considered that none of the technical difficulties are insoluble. [See FSTA (1978) 10 11E315.] JRR

42

Microwave oven growth spurs changes in convenience food packaging.
Boutin, R.
Food Product Development 12 (1) 90, 92 (1978) [En] [Int. Paper Co., New York City, New York, USA]

The rapid success of the microwave oven and the problems that Al can cause with this method of cooking have necessitated the development of a container suitable for both microwave and conventional ovens. The International Paper Company introduced Pressware dual-oven trays made from resin-coated paperboard. The trays are applicable in a wide range of food uses including entrees, casseroles and bakery items. Pressware is under consideration or being introduced by more than 150 major food processors. It shows particular promise in packaging frozen foods. Tests indicate that when used in a conventional oven it helps reduce cooking time or temp. VJG

43

The book of microwave cookery. [Book]
Allison, S.
128pp. ISBN 0-8153-7525-3 (1978) [En] Brunel House, Newton Abbot, Devon, UK; David & Charles (Publishers) Ltd.

This book on microwave cookery gives information and advice on the use of the microwave oven and includes the following chapters: Snacks, convenience meals, eggs and cheese (pp. 18-30) including a convenience food chart and recipes; Starters (pp. 31-37); Soups (pp. 38-41); Fish, (pp. 42-46), with a guide to defrosting and cooking fish, and recipes; Meat and poultry (pp. 47-69) including defrosting meat and poultry, defrosting times, defrosting times for an oven with a defrost switch or power control dial, cooking meat and poultry, meat and poultry 'roasting' chart, and recipes; Vegetables (pp. 70-79), including cooking fresh vegetables, cooking times, frozen vegetables, and recipes; Rice and pasta (pp. 80-83); Sauces (pp. 84-89); Puddings (pp. 90-99), covering defrosting frozen fruit, fresh fruit cooking chart and recipes;

Cakes (pp. 106-108), including recipes; Yeast mixtures (pp. 109-112); Confectionery (pp. 113-115); Preserves (pp. 116-119); Combination dishes (pp. 120-124); and Hints and tips (p. 125). A 3pp. subject index is also given. SP

44

Microwave thawing of peaches. A comparative study of various thawing processes.
Phan, P. A.
Journal of Microwave Power 12 (4) 261-271 (1977) [6 ref. En] [Lab. de Physiologie des Organes Vegetaux Apres Recolte, CNRS, Station du Froid, 4ter, Route des Gardes, 92190 Meudon, France]

The influence of various thawing treatments by microwaves and of air temp. on the exudation of peeled and unpeeled Clingstone peaches var. Vivian, in relation to fruit maturity was studied. Fruit at green and at mature stage, peeled or unpeeled, were halved, frozen to -20° C at the centre and stored in polyethylene bags at -20° C for 6 months. Thawing was by 1 of 3 methods: (i) thawing at 20° C, which required 8 h 25 min for centre of peaches to reach room temp.; (ii) thawing at 20° C until peach centres reached 4° C (4 h 25 min) and storing the product at 4° C (4 h); and (iii) in a microwave oven, with a cavity power of 550 W, 2450 MHz, until peach centres reached 4° C, and then stored in glass cells for 8 h 25 min at 4° C. Measurements of the amount of exudate, its content of total sugars and fruit browning (by colorimeter) to the end of thawing are presented in histograms. Thawing by (ii) and (iii) gave better water retention by the fruit tissues. Chemical peeling increased loss of exudate (× 1.5 times from unpeeled fruits). Exudation was 3-4 times lower with mature than with green fruits. With all thawing procedures the exudate of unpeeled fruits contained more total sugars. With (iii) whatever the stage of maturity of the fruit, the exudate contained less total sugars than with (i) and (ii), and gave better retention of soluble solids than (ii). Fruits suffered less browning with (ii) than with (i) and (iii), but (iii) browning was due solely to the long storage time at 4° C. From the economic point of view microwave thawing would save production time, and provide end products of better quality. SP

45

Rapid determination of the moisture content in aqueous dispersions of dairy products by means of microwave heating.
Lemmen, H. K.; Kessel, P. G. van; Kussendrager, K. D.
XX International Dairy Congress E. 391 (1978) [En] [Res. Lab., Zuid Nederlandse Melkind. BV, Veghel, Netherlands]

A microwave oven was modified to allow water to circulate through it to absorb excess energy, and by fitting a turntable to rotate the samples in the oven. Moisture contents in the range 35-85% were determined in 1.5 g samples + 20 g sand, with drying in 6-10 min, giving s.d. of 0.14-0.18% compared with conventional oven drying. [See FSTA (1978) **10** 10P1408.] JMD

46

[A quick method for determining moisture content in meat, meat products and ready meals.] Eine Schnellmethode zur Bestimmung des Wassergehaltes in Fleisch, Fleischwaren und Fertiggerichten.
Kolar, K.
Fleischwirtschaft **58** (3) 460-462; 397 (1978) [11 ref. De, en] [Swedish Meat Res. Cent., POB 24100, Kävlinge, Sweden]

The detn. of moisture in meats and ready-to-eat meals by the Apollo Laboratory microwave oven was compared with the standard drying technique. The instrument consists of a microwave oven with built-in balance. Optimum drying conditions are discussed for various products and 5-20 g samples. 86 samples were examined in 424 analyses including 40 replicates of a beef sample, and 40 of a Brühwurst sausage sample, and results are shown graphically and in a table. Both replicate series had a variation of 0.50 and s.d. of ±0.12. The pooled s.d. between duplicates (n = 86) was ±0.16 for the microwave and ±0.15 for the standard method, mean moisture content 0.01% higher by microwave, correlation of the 2 methods 0.999 and regression line y = 1.006-0.39. These results showed the 2 methods to be equally valid. The microwave method reduces the drying time from several h to 4-6 min. RM

47

Domestic microwave ovens: growth opportunity for the food industry.
Gerke, E. E.
Journal of Microwave Power 13 (1) 49-51 (1978) [3 ref. En] [Gerke Economics, Barrington, Illinois 60010, USA]

48

U. S. consumer microwave ovens - 1978.
Burbick, D. C.; Rennekamp, R. G.
Journal of Microwave Power 13 (1) 3-6 (1978) [En] [Amana Refrigeration, Inc., Amana, Iowa 52204, USA]

49

Microprocessor controls for microwave ovens.
Winstead, D.
Journal of Microwave Power 13 (1) 7-12 (1978) [En] [Fairchild Instruments & Systems Group, San Jose, California 95110, USA]

50

A review of microwave oven safety. [Review]
Osepchuk, J. M.
Journal of Microwave Power 13 (1) 13-26 (1978) [32 ref. En] [Raytheon Res. Div., Waltham, Massachusetts 02154, USA]

51

Microwave oven standards.
Gerling, J. E.
Journal of Microwave Power 13 (1) 37-41 (1978) [14 ref. En] [Gerling Moore, Inc., Santa Clara, California 95051, USA]

52

Dual-oven paperboard packages - a product of microwave industry growth.
Boutin, R. J.
Journal of Microwave Power 13 (1) 47-48 (1978) [En] [Pressware Int. Paper Co., New York, New York 10017, USA]

53

[A new principle for starch disintegration: the micronisator.] Neues Konzept für den Stärkeaufschluss: der Mikronisator.
Anon.
Mühle + Mischfuttertechnik 115 (25) 367-368 (1978) [De]

The principle, construction and operation of the micronizator, developed by the UK Micronizing Co., is described. A combined gas-heated and microwave oven uses IR irradiation for continuous production of cooked flakes from cereals and seeds without pre-treatment. Micronized beans were still fresh 6 months later. Capacity of the micronization unit is 1500 kg maize/h, 1500-2000 kg barley or wheat/h, and 700-1000 kg soybeans/h, for a consumption of 22 kg liquid propane and 32 m^3 natural gas/h. RM

54

[Effect of different cooking methods on amino-deoxy-ketoderivatives added to starch-based foods.]
Garutti, M. A.; Mazzaracchio, P.; Barbiroli, G.
Rassegna Chimica 28 (5) 209-212 (1976) [7 ref. It, en] [Univ. di Bologna, Bologna, Italy]

The effect of various forms of cooking (traditional or IR ovens at 220° or 240° C, microwave ovens, boiling in water) on amino acids added with or without sugar and on amino-deoxy-ketoderivatives of amino acids added to wheatmeal bread, wheat and cornmeal biscuits, polenta and potato flour cakes was investigated. Tabulated results showed that baking at 240° C or in microwave ovens produced substantial decomposition of the derivatives into their original amino acids, and substantial formation of the derivatives from free amino acids + sugars. RM

55

Microwave conditioning of durum and HRS wheat in a closed system.
Doty, N. C.
Dissertation Abstracts International, B 38 (1) 1: Order No. 77-10663, 143pp. (1977) [En] [N. Dakota State Univ., Fargo, N. Dakota 58102, USA]

Conditioning Crosby durum and Waldron hard red spring (HRS) wheat with microwave energy caused concomitant grain temp. elevations. Durum wheat 200-g samples were microwave conditioned at 15.0, 15.5 or 16.0% tempering moistures up to 55° C. Intermediate and final product quality after micro milling was not adversely affected. However, nonlinear analysis of semolina extraction rates indicated predictable rate increases of 5.8% were attainable. Microwave conditioning of durum and HRS wheat from 22° C to > 100° C was employed before experimental Buhler milling. Statistical and graphical analysis of intermediate and final product quality parameters indicated that microwave energy very significantly affected nearly all physical and biochemical properties of wheat after prolonged exposure to microwave irradiation. Intermediate and final wheat milling and product quality parameters were predictably modified with the use of microwave conditioning. Judicious allotment of specific durations of microwave power during durum and HRS wheat conditioning increased milling performance and product quality. Semolina extraction rate was increased by 3.2% with microwave conditioning prior to Buhler milling. Spaghetti quality of the resultant semolina improved due to increased cooked spaghetti firmness. HRS flour extraction rate was increased by 1.9% with microwave conditioning prior to Buhler milling. Bread quality, from the resultant flour, improved due to increased loaf vol. AS

56

Determination of the dry matter and fat content of cheese, using micro-wave oven and NMR equipment.
Uusi-Rauva, E.; Koljonen, K.
XX International Dairy Congress E, 379-380 (1978) [1 ref. En] [State Control Office for Dairy Products, Vattuniemenkuja 6, Helsinki 21, Finland]

Results with a micro-wave oven for determining DM and with a Newport Mk III NMR Analyzer for determining fat in Edam, Emmental and processed cheese compared favourably with results of other routine methods (drying oven and van Gulik) judged relative to reference methods. [See FSTA (1978) 10 10P1408.] ADL

57

The softening of butter using microwave energy.
Gatcombe, A. C.
XX International Dairy Congress E, 893 (1978) [En] [Milk Marketing Board, Thames Ditton, Surrey, UK]

Packaged 25-kg blocks of butter at -25° or -14° C were rapidly softened using a variable output microwave generator, power applied and rate of application depending on initial temp. of the butter. There were no significant organoleptic or chemical differences between microwave- and conventionally-softened butters. The use of microwave power for rapid softening prior to blending could save space. [See FSTA (1978) 10 10P1408.] JMa

58

Microwave and conventional reheating of chops from cooked hot and cold processed pork loin roasts.

Sigler, D. H.; Ramsey, C. B.; Jones, H. E., Jr.; Tribble, L. F.

Journal of Animal Science 46 (4) 971-976 (1978) [19 ref. En] [Dep. of Anim. Sci., Texas Tech. Univ., Lubbock, Texas 79409, USA]

· Loin roasts from pork carcasses were removed either prerigor (hot processed, HP) from 1 side or after chilling of the opposite side for 24 h (cold processed, CP). The roasts were cooked to an internal temp. of 63°C before being cut into 2-cm chops either before freezing or after freezing of the roasts. Following frozen storage for as long as 19 days, chops were thawed and reheated by conventional (broiled) or microwave methods to 68°C. Cooking losses and times were lower ($P < 0.05$) for HP than for CP roasts. Reheating losses of chops did not differ between processing methods; however, chops reheated by broiling averaged 5.7% higher total cooking losses and 14.1 min longer reheating time than microwave reheated chops. HP chops were more tender than CP chops, but processing method did not affect sensory panel juiciness or flavour scores. Chops reheated by broiling were superior in all palatability traits to microwave reheated chops. Sarcomere length measurements supported all tenderness evaluations with longer sarcomeres accompanying higher tenderness scores (Ⓡ = 0.40) and lower Warner-Bratzler shear values (Ⓡ = 0.46). Results indicate that processors can use HP methods without sacrificing tenderness or flavour. However, juiciness score means indicated that all treatments were 'neither juicy nor dry'. Further research should be aimed at improving the juiciness of reheated prerigor processed pork loins. AS

59

A comparison of four methods of heating beef roasts: conventional oven, slow cooker, microwave oven, and pressure cooker.

Brady, P.; Penfield, M. P.

Tennessee Farm and Home Science No. 101, 15-17 (1977) [12 ref. En] [Dep. of Food Sci., Coll. of Home Economics, Univ. of Tennessee, Knoxville 37901, Tennessee, USA]

The quality of beef round roasts heated in (i) a conventional oven, (ii) slow cooker, (iii) pressure cooker and (iv) a microwave oven were compared. Each roast was cooked with 119 ml water. Energy consumption, total cooking loss, shear values and sensory parameters of roasts prepared by the various methods were measured. Meat was cooked for 10 h in (ii), for 1 h 40 min at 325°F by (i), for 15 min lb in (iii), and for 18 min in (iv). Results of detn. were for (i), (ii), (iii) and (iv) resp.: average roast wt. (g), 709.63, 645.14, 631.2 and 626.0; cooking time (min/kg), 142.10, 930.33, 28.73 and 23.97; energy consumed (kWh), 1.148, 0.738, 0.389 and 1.242; Warner-Bratzler shear (kg), 6.02, 3.24, 7.08 and 7.40; and cooking losses (%), 38.06, 42.68, 30.74 and 32.88. Sensory evaluation of the cooked roasts showed that of parameters studied, internal colour, tenderness, juiciness, flavour, and overall acceptability, only juiciness was significantly different, and was significantly lower in (ii). All roasts were rated between good and very good. It was concluded from the sensory data that consumers should establish individual criteria for selection of cooking method. SP

60

Cook/chill foodservice systems: microwave heating precooked portions of beef loaf.

Dahl, C. A.; Matthews, M. E.

Journal of Microwave Power 13 (1) 87-93 (1978) [15 ref. En] [Dep. of Food Sci., Univ. of Wisconsin, Madison, Wisconsin 53706, USA]

Studies on reheating of 100 g portions of precooked ground beef loaf in a microwave oven (operating at 2450 MHz, manufacturer's rating 1250 W/h) are described. 10 beef loaf portions were used in each of 4 replications. The meat loaf portions (initial temp. 6.0-15.0°C) were microwave heated to temp. ⩾74°C, and the final temp., temp. change, microwave heating time, heating rate and % portion yield were determined. Tables of results are given. Overall mean values and ranges were: final temp. 81.7 and 74.0-93.0°C; temp. change 51.0 and 42.0-68.0°C; heating time 46.1 and 35.0-60.0 S; rate of heating 1.0 and 0.9-1.5°C/s 100g; and % yield (preheat wt. basis) 87.8 and 80.0-94.0. The results are discussed in relation to use of microwave ovens in hospital cook/chill food systems. The importance of accurate temp. control of the heated product (to ±1°C) is considered, and it is suggested that a suitable thermal monitor system for processed foods should be developed. AJDW

61

Microwave cookery for meats. (In 'Proceedings of the 30th Annual Reciprocal Meat Conference' [see FSTA (1978) 10 12S1789].) [Lecture]

Baldwin, R. E.

pp. 131-136 (1977) [27 ref. En] [Dep. of Food Sci. & Nutr., Univ. of Missouri, Columbia, Missouri 65201, USA]

Microwave cooking is discussed in relation to meat quality, with reference to literature and experimental data. Aspects considered included: comparisons between conventional and microwave cooking (microwave cooking giving higher wt. losses than conventional roasting, but no effect on tenderness being observed); frequency and cooking power; energy distribution pattern; temp. distribution in the meat; desirable shape, size and mass of meat for microwave cooking; effects of fat cover and bone content of the meat; and browning of meat during microwave cooking. The need for further research on microwave cooking of meat is discussed, together with the possible use of the microwave oven as a research tool. AJDW

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FAB 5

MICROWAVES IN FOOD PROCESSING

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H. BROOKES

EDITOR

1

Dehydrated food.
Rahman, A. R. (**United States of America,** Secretary of the Army)
United States Patent 4 096 283 (1978) [En]

Process for making dehydrated vegetable and meat products comprises partially freeze-vacuum-dehydrating particles of food to a moisture content of 10–35%, followed by microwave irradiation to produce redistribution of core moisture. The particles are then subjected to pressure to form a compacted food mass. IFT

2

Microwave cookbook. [Book]
Marshall, A.
128pp. ISBN 0-7271-0299-0 (1978) [En] Dee Why West, Australia; Paul Hamlyn Pty Ltd. Price £1.99

This book on microwave cookery gives over a 100 tested recipes for a 600 W microwave oven. Contents include: Cooking with microwaves (p. 8); Microwave utensils (pp. 9–10); Importance of timing (p. 11); Microwave cooking tips (pp. 12–13); Guide to weights and measures (p. 14); Savouries and snacks (pp. 15–24); Soups (pp. 25–32); Fish (pp. 33–46); Meat (pp. 47–76); Poultry (pp. 77–84); Vegetables (pp. 85–94); Sauces (pp. 95–100); Desserts (pp. 101–112); Biscuits and cakes (pp. 113–124); and Hot drinks (pp. 125–126). A 2pp. subject index is also given. SP

3

[Euphausia processing.]
Eiyo Co. Ltd.
Japanese Patent 5 312 985 (1978) [Ja]

Boiled euphausia is pre-dried, coated with a vegetable oil and then dried at 170–180° C using microwave energy. IFT

4

[Use of microwaves in supplementary post-slaughter examination.]
Adamczyk, E.; Chmielowski, W.
Medycyna Weterynaryjna 33 (11) 649–651 (1977) [7 ref. Pl, ru, en] [Inst. Higieny Produktow Zwierzecych, Wydzial Weterynaryjny, AR, Wroclaw, Poland]

Samples of muscle and fat from the inguinal region of slaughtered (i) cryptorchid (wt., 130–150 kg) or (ii) late-castrated (3 months before slaughter, at 350 kg body wt.) boars were examined organoleptically for the presence of the characteristic sex odour due to 5-α-androst-16-en-3-one after roasting or boiling in a microwave oven or by traditional preparation. In tests with 23 (i) and 11 (ii) samples, microwave roasting gave positive results in 39 and 100% respectively vs. 26 and 91%; for boiling, corresponding % were 39 and 100 vs. 30 and 100. The characteristic odour could also be detected much more rapidly after microwave-oven treatment. Use of microwave ovens is recommended for detection of odour defects in meat samples. SKK

5

[Activation of enzyme preparations in ultra high frequency electromagnetic field.]
Popadich, I. A.; Gubiev, Yu. K.; Kulikova, L. S.
Izvestiya Vysshikh Uchebnykh Zavedenii, Pishchevaya Tekhnologiya No. 2, 112–114 (1978) [2 ref. Ru] [Moskovskii Ordena Trudovogo Krasnogo Znameni Inst. Pishchevoi Promyshlennosti, Moscow, USSR]

The changes of amylolytic activity were studied in aqueous solutions of the enzyme preparation Amylosubtilisin G10X during heat treatment in a microwave field using apparatus with uniform heat distribution and absence of any temp. gradients. Heating of a 0.01% solution was carried out in a temp. range of 20–65° C for 5–20 s. The amylolytic activity was then compared with that of untreated preparations (100%). The results showed that the treatment increased amylolytic acitivity of the heated preparations by 70%. The max. activation was achieved with a rate of heating not exceeding 1.8–2.0° C/s. STI

6

New metal materials for microwave browner coatings.
Stempin, J. L.
Abstracts of Papers, American Chemical Society 176, ACSC 4C (1978) [En] [Corning Glass Works, Corning, New York 14830, USA]

The best dishes (Corningware) used for browning of food in microwave ovens rely on an SnO_2 electrically conducting coating (400 ohm/cm^2) on the undersurface. The average temp. achieved is seldom >500° F. Novel metal alloy systems, including 36% Ni/64% Fe and 70% Al/30% Si, give better heat distribution and 40% higher max. temp. than those of the SnO_2 coating. The heating efficiency probably results from formation of eddy currents which create small 'I^2R' heating elements throughout the surface. Chemical and detergent durability and abrasion resistance of the metal coatings is achieved by glazing with a stable glass using screening or decal techniques. Neither system interferes with the Code 9608 glass ceramic substrate strength, with no apparent cermet reactions. These alloys also have potential applications for integral elements. AS

7

The role of the microwave oven in reducing energy consumption in commercial food service.
Snyder, O. P., Jr.
Journal of Microwave Power 13 (3) 263–267 (1978) [6 ref. En] [Dep. of Food Sci. & Nutr., Univ. of Minnesota, St Paul, Minnesota 55108, USA]

Data are given on the energy efficiency of typical food service systems and equipment with a breakdown which includes energy actually required to cook food. A comparison of microwave and convection oven efficiency is also presented. Simple changes which could be made in food service operations to significantly increase their energy efficiency in food preparation are also considered. It is concluded that while many

alternatives exist for heating and cooking food, the microwave oven represents a very energy efficient solution in many food service applications; energy savings may reach 65% vs. convection ovens. SP

8

Microwave power applications in Japan.
Kase, Y.; Ogura, K.
Journal of Microwave Power 13 (2) 115–123 (1978) [14 ref. En] [Range Div., Sharp Corp., Hirano, Osaka, Japan]

9

Microwave drying of microorganisms. II. The use of microwave oven for the determination of moisture content of pressed yeast.
Leonhardt, G. F.; Gomes, A. M. F.; Borzani, W.; Torloni, M.
Journal of Microwave Power 13 (3) 235–237 (1978) [7 ref. En] [Dep. of Chem. Engineering, Escola de Engenharia Maua, CP 5657, Sao Paulo, Brazil]

The use of a microwave oven for detn. of the moisture content of pressed yeast (Saccharomyces cerevisiae), was tested, using a 2450 MHz microwave oven with an input power of 2.1 kW. Results (presented in a table) obtained were compared with those determined by a conventional drying oven. Microwave oven detn. (M) were always smaller than conventional measurements (C), due probably to the fact that dielectric permittivity decreases when temp. increases and moisture content decreases. A linear correlation was found to exist between the results obtained by the 2 methods. It was concluded that it is possible to apply the microwave method as described for rapid detn. of pressed yeast moisture content if the correlation $C = 0.83M + 12.57$ is used. [See FSTA (1976) 8 4G235 for part I.] SP

10

Microwaves used in determining avocado maturity.
Swarts, D. H.
Citrus and Sub-Tropical Fruit Journal No. 535, 3–5, 14 (1978) [6 ref. En, af] [Citrus & Subtropical Fruit Res. Inst., Nelspruit, South Africa]

The maturity of avocados was determined by analysing the moisture content of the flesh. Samples of grated avocado flesh were dried in 1 of the following driers: (i) a conventional force-draught oven set at 70–75° C; (ii) an IR moisture detn. balance with the heat set at 3.5 W and the lamp 25–30 mm above the sample; or (iii) a slightly modified household microwave oven with the output of 500 W at 2450 MHz. The results presented in graphs show (i) took 175 min to dry, while (ii) took 41 min and (iii) averaged 30 min. (iii) was concluded to be the ideal oven for avocado moisture detn. due to its rapidity in drying and also that it can take ≤ 18 samples simultaneously within 40 min. Advantages of using method (iii) include the ease of carrying out 'spot-checks' at packhouses or ports, and also the relatively inexpensive equipment required. SP

11

[Studies on the effect of conventional and novel roasting methods and grilling on the nutritive value of pork.] Untersuchungen über den Einfluss konventioneller und neuartiger Bratverfahren und des Grillens auf den Nährwert von Schweinefleisch.
Bognar, A.
Fleischwirtschaft 58 (7) 1176–1182; 1105 (1978) [11 ref. De, en] [Bundesforschungsanstalt für Ernährung, Garbenstrasse 13, 7000 Stuttgart-Hohenheim, Federal Republic of Germany]

The effect of 15 domestic roasting and grilling methods on moisture, protein, fat, minerals, thiamin and riboflavin contents of pork was investigated. Results, shown graphically and in tables, revealed considerable reductions in all the nutrients in relation to cooking time, temp. and method, within the following range: % loss of wt. 25–39, moisture 35–51, protein 2.5–7.3, fat 18–45, minerals 2–34, thiamin 25–62, riboflavin 12–41. If the nutrient content of the gravy was considered, protein and mineral losses were unimportant and fat loss reduced to 4–35%. The fat loss was closely related to cooking method, with smallest loss (4–11%) during braising, roasting in conventional electric cookers on a grill without added water or in microwave/hot air combination ovens, greatest loss (28–35%) during roasting in an electric cooker in plastic film or Al foil. Thiamin loss (the best criterion for nutritional evaluation of cooking methods) was not reduced by roasting in glass containers, plastic film or Al foil in conventional electric ovens and was of the same order of magnitude (about 50%) as during roasting on the grill in a gas oven with or without air circulation; it was reduced to 40% by using porous earthenware pots in an electric oven or by microwave cooking (attributed to higher temp. and shorter cooking time). Losses could be reduced by using smaller pieces of meat (shorter cooking time). Riboflavin losses were greatest in a microwave/air circulation cooker (34–41%), smallest when roasting on the grill in a conventional electric cooker (12%), suggesting that its breakdown was affected by other than temp./time conditions. RM

12

Microwave thawing of food products using associated surface cooling.
Bialod, D.; Jolion, M.; LeGoff, R.
Journal of Microwave Power 13 (3) 269–274 (1978) [En] [Electricite de France, Direction des Etudes et Recherches, Les Renardieres, Route de Sens-Eculles, 77250 Moret sur Loing Cedex, France]

The amount of frigorific energy required as a function of the thickness of product to be thawed and the end temp., was studied during rapid microwave thawing. With thick slices surface cooking is essential, for which cryogenic liquids, liquid N and Freon 12, were used. Data (wt., dimensions, discharge flow, Kv, pressure, time, temp. etc.) for thawing of tuna fish, beef and pork samples are presented in a table. The advantage of an efficient cooling system with an adjustable intensity is the ability to thaw products of varying thickness to a final homogeneous temp. throughout the product > −4° C. This system should thus permit continuous

thawing of various products (particularly fish and meat), when the end temp. ought to be $> -4°$ C. The same tunnel may be used for rapid deep freezing when the cryogenic liquid is used alone. SP

13

Observations of electric field intensity patterns in microwave ovens.
Hiratsuka, A.; Inoue, H.; Takagi, T.
Journal of Microwave Power 13 (2) 189–191 (1978) [4 ref. En] [Consumer Products Res. Lab., Mitsubishi Electric Corp., Ofuna, Kamakura, Japan]

Liquid crystal (LC) films were used to observe microwave field intensity patterns in microwave oven cavities. 2 dimensional colour patterns on the LC film resembling the field intensity are shown. From these patterns one can obtain some qualitative information about the effect of the stirrer rotation and the load of the oven. AS

14

Input impedance measurement of microwave ovens.
Ogura, K.; Takahashi, H.; Namba, I.
Journal of Microwave Power 13 (2) 183–188 (1978) [11 ref. En] [Magnetron Eng. Dep., Tokyo Shibaura Electric Co., Ltd., 72 Horikawacho, Saiwai-ku, Kawasaki-shi, Kanagawa-ken, Japan]

15

Analysis of power density distribution in microwave ovens.
Watenabe, M.; Suzuki, M.; Ohkawa, S.
Journal of Microwave Power 13 (2) 173–181 (1978) [8 ref. En] [Consumer Products Res. Cent., Hitachi Ltd., Yoshida-machi, Totsuka, Yokohama 244, Japan]

The power density distribution and the input admittance of the microwave oven are evaluated theoretically. The experimental results for the power density distribution show good agreement with the calculated values. In a domestic microwave oven cavity over 10 propagating modes and an infinite number of non-propagating modes exist, so the pattern of power density distribution becomes very complicated. Calculations are performed by taking all modes into consideration. AS

16

Power control of domestic microwave ovens by switching in the high-voltage circuitry.
Niu, T.; Yuzu, T.; Takata, A.; Motozuka, Y.; Yokozeki, S.
Journal of Microwave Power 13 (2) 193–197 (1978) [En] [Matsushita Ind. Equipment Co. Ltd., 3-1-1, Inazu-cho, Toyonaka, Osaka 561, Japan]

A new power control method was developed in which a high-voltage switch is used, and the output power is controlled by changing the interval of half-wave current flow time in the secondary circuit of the transformer. The switch is actuated at zero-current (intermittent of half-wave current) by a controller and a phase-control device. With this method, there is no rush current, no electric arc and little magnetron filament temp. change, which results in increased life of the magnetron. AS

17

[Application of microwaves. Moisture determination in sugar factory products.]
Devillers, P.; Detavernier, R.; Groult, M.
Industries Alimentaires et Agricoles 95 (7/8) 739–745 (1978) [9 ref. Fr, de, en]

The authors describe a microwave oven adapted for moisture detn. in a sugar factory laboratory. This achieves complete drying of all liquid products, pulp and white sugar in 15–20 min. Results for 5 molasses compared well with those obtained by GLC, oven drying at 105° C and the Karl Fischer method, with coeff. of variation 0.44–0.91 vs. 0.94–2.50, 0.47–0.94 and 0.59–2.94 resp. Pulp and pellets showed no sign of excessive heating. The speed of microwave detn. suggests its use for bulk sugar control. RM

18

A new microwave moisture meter for grains.
Miyai, Y.
Journal of Microwave Power 13 (2) 163–166 (1978) [4 ref. En] [Res. Lab., Matsushita Electronics Corp., 1-1 Saiwai-cho, Takatsuki-shi, Japan 569]

A new microwave moisture meter for grains operating at a frequenca of 10.5 GHz is described. The meter uses a hybrid microwave integrated circuit (MIC) and a strip line sensor which measure the extent of microwave attenuation arising from the moisture content of grain passing over the sensor. Comparisons with the oven-drying method are given. The newly developed microwave moisture meter allows continuous and accurate measurements. The meter is of simple construction and can be easily attached to an already existing dryer. SP

19

Beef thawing and cookery methods. Effect of thawing and cookery methods, time in storage and breed on the microbiology and palatability of beef cuts.
Moody, W. G.; Bedau, C.; Langlois, B. E.
Journal of Food Science 43 (3) 834–838 (1978) [38 ref. En] [Dep. of Anim. Sci., Univ. of Kentucky, Lexington, Kentucky 40506, USA]

Steaks and roasts from Angus and Simmental crossbred steers were evaluated by a 9-member panel, and sample cores were sheared on the Instron Universal Testing Device equipped with a Warner-Bratzler shear head. The meat was subjected to 5 different thawing and cooking methods and 2 frozen storage periods. There was a difference ($P < 0.01$) in microbial numbers (log counts) found on the roasts due to incubation temp. (37° C vs. 7° C) and time in storage (fresh, 5 months and 10 months). The fresh roasts had higher ($P < 0.01$) mean log counts. Slightly higher total cooking losses were observed for the roasts than for the steaks. The highest Instron shear values for both roasts and steaks were recorded for the microwave-thawed and cooked meat. Overall panel satisfaction for both cuts of meat was positively correlated with flavour, juiciness and tenderness. Storage time was negatively correlated with flavour. Breed had no significant effect on flavour, juiciness, tenderness, overall satisfaction or shear values. Differences ($P < 0.025$) were found

between the microwave and conventionally cooked meat, with the microwave-cooked meat having the greatest cooking losses. IFT

20

Moist-heat microwave and conventional cooking of round roasts of beef.
Korschgen, B. M.; Baldwin, R. E.
Journal of Microwave Power 13 (3) 257–262 (1978) [13 ref. En] [Dep. of Food Sci. & Nitr., Univ. of Missouri-Columbia, Missouri 65201, USA]

Round roasts of beef were cooked by moist-heat microwave and by conventional oven braising (135° C) to an internal temp. of 98° C. For the microwave procedure, the meat was cooked at 'high' and 'simmer' power levels, and cooking time was ⅓ (40.7 min/kg) of that required for the conventional method (148.4 min/kg). Mean scores for flavour and juiciness differed little between samples prepared by the 2 methods. However, mean scores for tenderness were higher and shear values were lower for the conventionally cooked product than for that cooked by microwaves. There were no significant differences in cooking losses, or moisture, fat, protein, thiamin, riboflavin, niacin, Na, Fe and K contents of meat cooked by the 2 methods. Thiamin, riboflavin and K retentions were significantly higher in meat cooked by microwaves than in that cooked conventionally. Free amino acid content differed little between meat prepared by the 2 methods. AS

21

Microwave. The cooking revolution. [Book]
Webb, J. M.
ix + 90pp. ISBN 0-901762-26-1 (1977) [8 ref. En] London, UK; Forbes Publications Ltd. Price £2.50

This book on microwave cooking describes how microwave ovens work, what they will and won't do, and how to use them as a new cooking technique particularly suited to our fast moving times. Chapters include: How a microwave oven works, covering security in design, how a microwave oven cooks food and siting the microwave oven (pp. 1–9); The art of thawing, heating and cooking food in a microwave oven (pp. 10–35); Tips for the microwave oven user (pp. 36–41); The use of microwave in catering (pp. 42–50); Nutritional aspects (pp. 51–53); The features of a microwave oven (pp. 54–69); Cooking utensils and containers (pp. 70–76); Cleaning the appliance (pp. 77–78); and Capital, maintenance and running costs (pp. 79–86). A glossary of terms (pp. 87–88) and a bibliography are also included. SP

22

Thermal destruction of folacin in microwave and conventional heating.
Cooper, R. G.; Chen, T.-S.; King, M. A.
Journal of the American Dietetic Association 73 (4) 406–410 (1978) [26 ref. En] [Dep. of Home Economics, California State Univ., Northridge, California, USA]

The relative thermal stability of 4 folacin derivatives ((i) PGA, (ii) DL,L-THFA, (iii) DL-N-5-methyltetrahydrofolic acid, and (iv) calcium 5-formyltetrahydrofolic acid) was determined. The effects of microwave energy on folacin were evaluated and a comparison made of the effects of microwave energy vs. conventional thermal energy on folacin. The folacin derivatives were found to vary greatly in thermal stability, but (i) was extremely stable to heat under the experimental conditions i.e. at 100° C in neutral solution. (iv) also exhibited marked stability under those conditions and neither (i) nor (iv) was significantly affected by microwave radiation. (ii) was found to be extremely labile, while (iii) had intermediate stability among the forms tested. Microwave heating of (iii) resulted in a faster rate of degradation than conventional heating at the same temp. VJG

23

Baking with high frequency – a present day's view.
Seiler, K.
CCB Review for Chocolate, Confectionery and Bakery 3 (3) 34–38 (1978) [En]

The theoretical principles of microwave (MW) and high frequency (HF) heating are explained together with their modern application to practical baking. With HF heating, heat is generated within the material itself; thus 1 kg bread dough can be completely and uniformly baked in a HF oven in 7–8 min, but the bread has no crust. With IR heating, the heating effect is most rapid on the outside, giving external browning with little internal penetration. A combination of HF and IR heating enables bread to be baked in a much shorter time than in the conventional steam-heated oven. New baking processes are described in which 20–25% of the energy input is supplied by HF in the first quarter of a continuous oven and the remaining 75–80% in an IR section. Application of HF and IR can be varied independently according to the product. Advantages over conventional ovens are shorter baking time, reduced length of oven, better retention of cereal B_1 vitamins, and more uniform baking and distribution of loaf moisture. Technological advantages of baking crisp bread by HF-IR are also described. Recent increases in the cost of electrical current have reduced the former financial advantage of HF-IR heating over conventional ovens. HF heating has not been incorporated successfully in conventional tunnel ovens. ELC

24

Measurement of total milk solids by microwave heating.
Takahashi, Y.; Nagi, A.; Suga, N.; Chiba, J.
Journal of Microwave Power 13 (2) 167–171 (1978) [3 ref. En.] [Anritsu Electric Co. Ltd., 1800 Onna, Atsugi-shi, Kanagawa, 243, Japan]

For detn. of TS, 1 g milk sample is applied to a glass fibre filter (26 mm diam.) and dried quickly in the drying unit which consists of a microwave generator, waveguide type oven, electrobalance and indicator unit. The sample is positioned on the scale stand of the electrobalance within the drying unit, and wt. before and after drying is displayed digitally. 50 tests on samples from the same batch of milk showed an s.d. of 0.018% TS. Max. deviation from results by the official method was 0.05% TS and average value for TS was 12.164% vs. 12.150% by the official method. Testing

time was reduced from 8 h to 3.5 min by using this TS measuring instrument. CDP

25

[Changes in volatile fatty acids in roast pork with different heat processing methods.]
Rogov, I. A.; Deniskina, T. G.; Yasyreva, V. A.; Zharinov, A. I.
Myasnaya Industriya SSSR No. 4, 40–41 (1978) [3 ref. Ru] [Moskovskii Tekh. Inst. Myasnoi i Molochnoi Promyshlennosti, Moscow, USSR]

It is anticipated that the use of new heat processing methods, especially those using electromagnetic fields of a very high frequency, will affect the content of volatile constituents in meat products. Changes in volatile fatty acids in roast pork were investigated. The meat was roasted using the conventional method or by microwave heating. Samples of meat were processed in a microwave oven (output 0.9 kW, cooking time 16 min) and in an electric oven. The samples were then cooled and the content of volatile fatty acids was determined. Volatile fatty acids were isolated using vacuum distillation, and methyl esters were separated by gas chromatography. It was established that, in roast pork without lard, the content of the majority of volatile fatty acids was somewhat higher than in the initial raw material. Isovaleric and capric acids formed an exception. The content of volatile fatty acids in meat cooked in a microwave oven exceeded or was equal to that in conventionally-cooked samples. STI

26

Cook/chill foodservice systems: microbiological quality of beef loaf at five process stages.
Dahl, C. A.; Matthews, M. E.; Marth, E. H.
Journal of Food Protection 41 (10) 788–793 (1978) [24 ref. En] [Dep. of Food Sci., Coll. of Agric. & Life Sci., Univ. of Wisconsin-Madison, Madison, Wisconsin 53706, USA]

Preparation and service of hot entrees in hospital cook/chill food service systems require 2 heat processes. After preparation and mixing, beef loaves composed of ground beed and eggs were heat-processed initially to end-point temp. of 45°, 60°, 75°, or 90° C in a convection oven operating at 121° ± 6°C; stored 24 h at 6° ± 1° C; portioned into 100-g slices; and single portions were microwave-heated to ≥74° C. 4 heat treatments of beef loaves were compared to a 5th treatment which excluded initial heating. Quality of beef loaf was evaluated by mesophilic and psychrotrophic aerobic plate counts, coliform counts, streptococcal counts and pH. Microbial reductions caused by handling and processing were: aerobic mesophilic plate count, 88–99%, psychrotrophic aerobic plate count and coliform count, ≥99%; and streptococcal count, 71–99%. Increasing end-point temp. of initial heat processing consistently ($P \leq 0.05$) decreased mesophilic and psychrotrophic aerobic plate counts. Coliform counts and streptococcal counts did not show a statistical relationship to end-point temp. of initial heat processing. No statistically significant differences existed in any microbiological counts among 5 treatments of beef loaf portions after microwave-heating. Varying end-point temp. of initial processing had no consistent statistical effect on the pH of beef portions. Temperatures of ≥74° C for microwave-heating of beef portions after chilled storage and before service are strongly recommended since chilling 5000 g of beef loaf to ≤7° C required 10–14 h at 6° C. AS

27

[Effects of modern roasting methods on the nutritional value of pork.] Einfluss neuartiger Bratverfahren auf den Nährwert von Schweinefleisch. [Lecture]
Bognar, A.
Lebensmittelchemie und Gerichtliche Chemie 32 (5) 110–111 (1978) [De] [Bundesforschungsanstalt für Ernährung, Inst. für Hauswirtschaft, 7000 Stuttgart, Federal Republic of Germany]

Studies on losses of fat, thiamin and riboflavin during roasting of pork are discussed, with reference to effects of oven type and cooking method. Fat loss was lowest (4–11%) for microwave roasting or roasting on a rack in a conventional oven; and highest (28–35%) for roasting in a conventional oven, wrapped in plastics film or Al foil. Block diagrams are given showing effects of roasting method on thiamin and riboflavin concn. Thiamin loss during roasting ranged from 25 to 62%. Roasting in a conventional oven in Al foil, plastics film or a Jena glass container gave no advantage over roasting on a rack; however, roasting in a microwave oven or in a conventional oven in a pottery container gave lower losses. Thiamin loss was lower from small than from large meat pieces, as a result of the reduced period of exposure to high temp. Riboflavin losses ranged between 10 and 41%; losses during microwave-roasting were higher than those during roasting on a rack in a conventional oven. [See FSTA (1979) 11 4G287.] AJDW

28

[Heat treatment of poultry.] Wärmebehandlung von Geflügel.
Buriankova, J.
Fleisch 32 (9) 175–177 (1978) [De] [Res. Inst. for the Poultry Ind., Bratislava, Czechoslovakia]

Comparative studies were conducted on various cooking methods for poultry: microwave heating, cooking in a convection oven, cooking in water, pressure cooking, and roasting by means of radiant heat. The required heat treatment times and the resultant wt. losses were determined, together with juiciness (evaluated organoleptically and by measurement of dry wt.). Cooking in water under pressure gave the best results; cooking times were 10–15 min for chickens, 20 min for ducks, and 30 min for turkeys. Yield is high, especially for chickens, and the juiciness is good as a result of water uptake during cooking. Convection ovens gave the best results in roasting trials; microwave roasting has the advantage of rapidity, but is only suitable for use in high-capacity processing lines. IN

29

Microwaves are safe and useful.
Cox, D.
Frozen Foods 31 (11) 28, 30 (1978) [En]

Microwave cookers are discussed with emphasis on their growing potential in the home to complement the ever increasing range of frozen convenience foods. AL

30

[Influence of thermal processes and microwaves on the amino acid composition of food products; implication for nutritive value.] [Lecture]
Gayte Sorbier, A.; Audibert, M.
Annales de la Nutrition et de l'Alimentation 32 (2/3) 437-446 (1978) [many ref. Fr, en] [27, Boulevard Jean-Moulin, 13005 Marseille, France]

A kinetic study of free amino N (formol value) and total soluble N in hard wheat semolina after heat treatment (convection at 80°, 120°, 135° or 200° C, microwave at 2450 MHz, 600 W) showed that they decreased with increasing time and intensity of treatment. Similar behaviour was usually shown in aminograms, the extent of decrease varying with the amino acid: methionine, valine and basic amino acids (histidine, lysine, arginine, tryptophan) were particularly sensitive, while proline and NH_3 contents actually increased. Some unidentified ninhydrin-positive compounds appeared. Microwave heating caused no more loss than convection heating at 120-135° C. [See FSTA (1979) 11 5A346.] RM

31

[Microwaves in the service of the food industry. (10 year balance).]
Meisel, N.
Industries Alimentaires et Agricoles 95 (9/10) 997-1003 (1978) [12 ref. Fr, de, en]

Evolution of the use of microwaves in the food industry over the past 10 yr is summarized. Domestic use in the USA has risen from 12% of houses in 1977 to an expected 20% in 1980. The impact on the industry of prepared dishes, packaging, etc. is considerable. Industrial applications, initially limited to thawing, have extended towards continuous vacuum drying of fruit powders, manufacture of pasta, cooking of meat and fish products. Quoted data show that pasta manufacture with microwave drying achieved savings of 75% factory space, 10% electricity, 52% steam, 75% cleaning and 80% maintenance; the total cost of microwave concn. for orange juice (excluding raw material) was 1.67 F/kg of powder, vs. 6.86 for freeze-drying. RM

32

Temperature distribution of microwave heating - spheres and cylinders.
Ohlsson, T.; Risman, P. O.
Journal of Microwave Power 13 (4) 303-310 (1978) [9 ref. En] [Swedish Food Inst., Fack, S-400 23 Goteborg, Sweden]

When irregularly shaped foods are heated with microwaves, nonuniform temp. distributions with hot and cold spots are sometimes formed. These nonuniformities which can be ascribed to scattering and concn. effects were studied in experiments using IR thermography technique and in computer simulations of the temp. distribution in spheres and cylinders. Comparisons were made between experimental and calculated results. The computer programs were also used for studies of the influence of a number of variables: diam., food composition and frequency. Experiments at 2450 MHz show that a heating concn. in the central parts occurs for spheres in a diam. range 20-60 mm and for cylinders in the range of 18-35 mm. Comparisons between calculations and experiments show good quantitative agreement for diam. between 20 and 50 mm. As expected, a more pronounced core heating effect was noted for spheres than for cylinders. The calculations predict that at 915 MHz core heating occurs at diam. >50 mm. Practical consequences of concn. effects are discussed, including the well-known explosion of eggs during microwave heating. AS

33

Microwave leakage indicating strip.
Kashyap, S. C.; Wong, J. Y.; Dunn, J. G.
Journal of Microwave Power 13 (4) 337-340 (1978) [6 ref. En] [Div. of Electrical Eng., Nat. Res. Council of Canada, Ottawa, Ontario, Canada K1A OR8]

A simple microwave leakage indicator in the form of a strip of encapsulated liquid crystal film backed by a layer of absorbing material is described. It is designed to indicate leakage beyond 1 mW/cm^2 which is the max. permissible level for microwave ovens. AS

34

Design problems in magnetrons for microwave ovens.
Ogura, K.; Takahashi, H.; Koinuma, T.; Tashiro, N.
Journal of Microwave Power 13 (4) 357-361 (1978) [4 ref. En] [Tokyo Shibaura Electric Co., Ltd., 72 Horikawacho, Saiwai-ku, Kawasaki-shi, Kanagana-ken, Japan]

The design problems of microwave oven magnetrons including mode stability of oscillation, thermal demagnetization and outgassing characteristics of Rare-Earth-Cobalt magnets and of vacuum sealed Alnico magnets are experimentally studied. AS

35

A microwave applicator for drying food samples.
Risman, P. O.
Journal of Microwave Power 13 (4) 297-301 (1978) [12 ref. En] [Husqvarna AB, Fack, S-561 01 Huskvarna, Sweden]

A compact system using a cylindrical microwave applicator for drying disc-shaped food samples is presented. The 2450 MHz applicator is designed to operate near TM_{011} resonance when drying begins, creating a ring-shaped heating distribution. As the sample dries out, the TM_{011} resonance diminishes and a TM_{010} field excitation takes over, drying the central parts of the sample. The initial power transfer exceeds 60%, but decreases to about 10% when the sample is dried. For most meat products, an input power of 200 W is sufficient to dry a 10 g sample in 6 to 8 min. AS

36

[Direct measurement of moisture level in hops. A test of moisture measurement in hops and hop pellets with a micro-wave moisture apparatus.]
Sofortmessung der Feuchtigkeit in Hopfen. Erprobung

der Feuchtemessung in Hopfen und Hopfenpellets mit einem Mikrowellen-Feuchtemessgerät.
Ganzlin, G.; Söder, J. M.
Brauwissenschaft 31 (11) 307–310 (1978) [4 ref. De, en, fr] [Lupofresh-Zentrallab., 8500 Nuremburg, Federal Republic of Germany]

Comparative studies were conducted on detn. of moisture in hops and hop pellets by the EBC drying oven method and by means of the Compur 5220 microwave system (manufactured by Compur Electronic, München, Federal Republic of Germany). Trials were conducted on 70 samples of hops and 40 samples of hop pellets. Agreement between the 2 methods was relatively good; s.d. ±0.35% for hops (over the moisture range 7–14%), and s.d. ±0.23% for hop pellets (over the moisture range 7–10%). Calibration curves for the microwave method must be established for each instrument type, product under test, etc. TUB-IGB

37

Folacin content of microwave and conventionally cooked frozen vegetables.
Klein, B. P.; Lee, H. C.; Reynolds, P. A.; Wangles, N. C.
Journal of Food Science 44 (1) 286–288 (1979) [32 ref. En] [Dep. of Foods & Nutr., School of Human Resources & Family Studies, Univ. of Illinois, Urbana, Illinois 61801, USA]

The effects of microwave and conventional cooking on the folacin retention of 4 frozen vegetables (spinach, peas, green beans and broccoli) were studied. Total folacin in spinach and peas was determined using Lactobacillus casei and Streptococcus faecalis. Since L. casei values were higher, this microorganism was used in the other assays. Folacin content of microwave and conventionally cooked vegetables was not significantly different. Retentions were approx. the same for each vegetable regardless of cooking method, and ranged from 78 to 105% except for broccoli. The low retention in broccoli (51–59%) may be due to the presence of heat labile forms of folacin. IFT

38

Flavor and color of peas and carrots cooked by microwaves.
Mabesa, L. B.; Baldwin, R. E.
Journal of Microwave Power 13 (4) 321–326 (1978) [19 ref. En] [Dep of Food Sci. & Nutr., Univ. of Missouri-Columbia, Columbia, Missouri 65211, USA]

Market samples of frozen peas and frozen carrots were cooked in a consumer and in an institutional microwave oven with 500 W and 1150 W cooking power, resp. Mean sensory scores for flavour and for colour of peas cooked in a consumer microwave oven were significantly higher than for those cooked in an institutional microwave oven. Also, retention of chlorophyll components as determined by their specific absorptivity in 80% acetone was significantly greater after cooking in a consumer microwave oven than in an institutional microwave oven. Flavour and colour of carrots cooked by all methods were acceptable. Although some significant differences occurred in sensory scores for orange colour of the cooked samples, cooking method did not significantly affect the carotene content, which was analysed by column chromatography. AS

39

New food products utilizing dairy ingredients with emphasis on protein. [Lecture]
Mykleby, R.
XX International Dairy Congress, Conferences Conferences 52ST, 4pp. (1978) [En] [Dairy Res. Inc., 6300 North River Road, Rosemont, Illinois 60018, USA]

A survey is presented of processed or prepared protein-enriched foods in the USA, with emphasis on dairy proteins. The need for and problems of food regulations are discussed, with concern expressed for cost/benefit relationships in providing consumer protection. The hotel, restaurant and institutional foodservice field is identified as an opportunity area for food processors, and foods developed for microwave cookery will become popular. [See FSTA (1979) 11 6P883.] DMK

40

[Effect of heating quick-frozen table-ready foods in high frequency ovens on their quality.]
Maradudina, N. V.; Moiseeva, E. L.; Balandina, G. A.
Kholodil'naya Tekhnika No. 7, 41–43 (1978) [Ru] [Vses. Nauchno-issled. Inst. Kholodil'noi Promyshlennosti, USSR]

4 different meat and 2 vegetable quick-frozen dishes were heated in a Volzhanka microwave oven (wavelength 1 cm, power 2500 W, frequency 2375 MHz); the dishes were first taken from their packs and placed in heat-resistant glass containers. Heating was at 60%, 100% or 60 + 100% oven capacity for 3.5–6, 0–3.5 or 1–3 + 1–3 min resp., depending on the dish. Controls were heated by the standard method (hot air at 250°C in Al trays with lids). Wt. losses, total bacterial count and coliform titre were determined. Results (tabulated) showed that the combination 60 + 100% oven capacity heating gave the best results; there was no wt. loss, heating required a total of 2–5 min (depending on product) and the bacterial load was very low. HBr

41

A method of producing crisp reheatable French fried potatoes.
Gorfien, H.; Rahman, A. R.; Westcott, D. E. (**United States of America**, Secretary of the Army)
United States Patent 4 109 020 (1978) [En]

An improved method of producing crisp, non-rubbery, reheated French fried potatoes, which are frozen for storage purposes after being fried in deep fat and subsequently reheated by means of a microwave oven without using additional hot air heating, is described. The improved properties result from a partial dehydration in a hot air oven or a combination of microwave oven heating and hot oven heating prior to deep fat frying to complete the cooking of French fried potatoes prior to freezing. SP

42

[Trends in the starch and sugar industries depending on raw material. I. Introduction.]
Entwicklungstendenzen in der Stärke- und Zuckerindustrie in Abhängigkeit vom Rohstoff. Teil 1. Einführung.
Kempf, W.
Stärke 30 (8) 254-256 (1978) [5 ref. De, en]
[Bundesforschungsanstalt für Getreide- & Kartoffelverarbeitung, Schützenberg 12, D-4930, Detmold 1, Federal Repulic of Germany]

In his introduction to the 28th meeting on starch of the German Society for Cereal Research held in Detmold on April 27th to 29th, 1977, the author discusses the trends towards increased production and utilization of wheat by using e.g. soft wheat for breadmaking by means of microwave baking and gluten enrichment, and of starch by production of derivatives and by enzyme technology. Finally, the importance of raw material for the starch and sugar industries is discussed. RM

43

[Comparison of retailing value of rabbit meat processed in a very high frequency magnetic field and by traditional heating.]
Nakonechnyi, N. S.; Belova, T. S.; Tkachenko, L. F.
Tovarovedenie 11, 40-43 (1978) [6 ref. Ru]

14 chilled and frozen rabbits, cut into 6 pieces each weighing 300-400 g, were heated by a Slavyanka microwave unit or by the standard technique. The heated samples were then analysed for amino acid, and fatty acid compositions, and peroxide, and 2-thiobarbituric acid (TBA) values of the lipids. Results (tabulated) showed that microwave-heated meat had 2.6% more essential amino acids and more unsaturated fatty acids than the traditionally-heated controls; there were no differences in lipid physicochemical characteristics or in sensory rating. Heating time was decreased by about two-thirds, and product yield was 2-3% higher with the microwave unit. KME

44

Microwave ovens and frozen foods make cents.
[Conference proceedings]
Decareau, R. V. (Editor)
Transactions of the International Microwave Power Institute 5, 113pp. (1975) [many ref. En] [IMPI, Box 1556, Edmonton, Alberta T5 2N7, Canada]

Papers presented at a 1-day short course at the United States Army Natick Development Center, Natick, Massachusetts on Oct. 23, 1975 include: Changing perceptions of food in modern life, by J. A. Koop (pp. 5-19); Basic principles of microwaves, by R. F. Schiffmann (pp. 20-39, 4 ref.); Microwave: capitalize, by V. Ludvigson (pp. 40-43); Nutrient implications of microwave cooking and heating of frozen foods, by C. Y. W. Ang & G. E. Livingston (pp. 44-61, 22 ref.); Microwave cooking utensils, by B. L. Jones (pp. 62-69); Food packaging options for the microwave oven market, by F. B. Shaw (pp. 70-77); Commercial microwave food service applications, by R. V. Decareau (pp. 78-88, 11 ref.); Microwave tempering of frozen foods, by A. F. Bezanson (pp. 89-100, 6 ref.); and Microwave research at Natick Development Center, by R. V. Decareau (pp. 101-111, 4 ref.) VJG

45

Can aluminum containers be used in microwave ovens?
Anon.
Food Engineering International 3 (9) 35 (1978) [En]

Compatibility of Al foil containers with microwave cooking is briefly discussed; frozen foods in Al containers may be successfully heated in microwave ovens, providing that the container does not touch the oven wall, although changed package design may alleviate this problem. DIH

46

New uses of microwave power.
Faillon, G.; Couasnard, C.; Maloney, E. D.
Food Engineering International 3 (9) 46-48 (1978) [En, de, fr, es] [Thomson-CSF Div. Tubes Electroniques, Boulogne, France]

See FSTA (1977) 9 11E404.

47

Microwave vacuum drying: first industrial application.
Attiyate, Y.
Food Engineering International 4 (1) 30-31 (1979) [En, de, fr, es] [Chilton Company, Chilton Way, Radnor, Pennsylvania, 19089, USA]

Application of microwave vacuum drying to production of orange powder from preconcentrated orange juice is described. Product is fed onto a conveyor belt in a 12-m long vacuum drying tunnel, and is heated by 8 magnetrons each rated at 6 kW. The dryer is manufactured by Industries Micro-Ondes Internationale, Epone, France. Final product moisture content is 2%, cycle time is 40 min, and output is 49 kg/h, corresponding to 500 kg oranges. Glow discharge is avoided by using specially designed irradiators and by adjusting input power to oven load. Product temp. is monitored by an IR thermometer, and instant temp. adjustment to ± 1°C is possible. Overall capital and running costs compare favourably with freeze drying and spray-drying. DIH

48

Microwave vacuum drying: quick, quiet, clean, efficient.
Elias, S.
Food Engineering International 4 (1) 32-33 (1979) [En, de, fr, es] [Chilton Company, Chilton Way, Radnor, Pennsylvania, 19089, USA]

Operation of the Mivac microwave vacuum dryer designed and built by the McDonnell Douglas Corporation is described. A dryer with a vertical drying chamber has been used for drying grain without the problems of dust and danger of fire that occur with conventional dryers. Products that have been successfully tested using the Mivac system include corn, peanuts, rice, wheat, bananas, raisin grapes, peaches, apricots, strawberries, raspberries, apples, peppers, tomatoes, soy protein and dried milk. [See also preceding abstr.] DIH

49

[Influence of reconstitution conditions for a prepared frozen food on heating time and reheated food quality.]
Carbonell, J. V.; Pinaga, F.; Valles, S.
Revista de Agroquimica y Tecnologia de Alimentos 18 (3) 323–334 (1978) [23 ref. Es, en] [Inst. de Agroquimica y Tecnologia de Alimentos, Valencia, Spain]

Effect of several reheating methods on the heating time and quality of prepared frozen food (beef goulash in individual portions) was studied. Reheating was done by boiling water, steam, hot air in natural and forced convection, IR and microwave radiation. Quality was evaluated by the colour and consistency of the sauce, carotenoid content in carrots, available lysine in meat and organoleptic acceptance. Reheating to 65°C core temp. by boiling water or steam took 17 and 24 min resp., vs. 54, 95 and 108 min by forced convection, natural convection and IR oven heating, and 24 min with a forced convection oven at 150°C. Microwave heating presented serious difficulties owing to uneven heat penetration into liquid and solid (ice) water phases. Chemical analysis of food heated at 100°C showed that shorter heating produced a better product. No differences in quality were observed between food heated in air at 100°, 125° or at 150°C (54, 32 and 24 min resp.) in the forced convection oven. The possible detrimental effect of the high temp. is counteracted by the shorter heating time. RM

50

Ascorbic acid in peas cooked by microwaves.
Mabesa, L. B.; Baldwin, R. E.
Journal of Food Science 44 (3) 932–933 (1979) [En] [Dep. of Food Sci. & Nutr., Univ. of Missouri-Columbia, Columbia, Missouri 65211, USA]

Market samples of frozen peas were cooked with or without water in a domestic microwave oven (115 V, 550 W cooking power) and in an institutional microwave oven (220 V, 1150 W cooking power). Total ascorbic acid, as determined by the 2,4-dinitrophenylhydrazine method, was higher in peas cooked without water regardless of cooking appliance. Microwave cooked peas tend to have greater retention of total ascorbic acid than those cooked conventionally. IFT

51

[Quality aspects of thawed fish.]
Vyncke, W.
Revue de l'Agriculture 31 (3) 541–547 (1978) [25 ref. Fr, en] [Sta. de Peche Maritime, Ankerstraat 1, B-8400 Ostend, Belgium]

The effect of the following thawing techniques on the quality of fish is discussed with the aid of published data: thawing in still air, in moist air with ventilation, in running water, in vacuum with condensing steam, dielectrically with macrowaves (e.g. 13.6 MHz), and microwaves (e.g. 2450 MHz; 915 MHz). The effect of thawing and refreezing is also considered. It was concluded that several excellent industrial thawing techniques are available which allow thawing with min. quality loss. The choice of method depends on a number of factors (fish spp., size, expected capacity, etc.) which must be considered in each case. Thawing in still air is not recommended. Refreezing thawed fish always entails additional loss of quality, especially consistency, also drip loss and oxidation. [From En summ.] RM

52

Comparison of sensitivity of microwave and conventional methods for meat cookery.
Baldwin, R. E.; Korschgen, B. M.; Krause, G. F.
Journal of Food Science 44 (2) 624–625 (1979) [En] [Dep. of Food Sci., Univ. of Missouri, Columbia, Missouri 65211, USA]

Comparison of data for similarly designed investigations of microwave and conventional cooking of meat indicated that differences among sensory scores and shear values were a function of treatment differences and not cooking method. However, there was a trend toward larger F-values to be associated with data for microwave cooking. IFT

53

Effect of microwave energy on poultry tenderness.
Dunn, N. A.; Heath, J. L.
Journal of Food Science 44 (2) 339–342 (1979) [En] [Dep. of Poultry Sci., Univ. of Maryland, College Park, Maryland 20742, USA]

This research determined if exposure of pre-rigor muscle to microwave energy would inhibit glycolysis and improve tenderness. Broiler muscle was exposed to microwaves for 0, 1.06 and 2.12 s/g and aged for 0, 30, 60 or 120 min prior to detn. of glycogen and ATP. Tissue used for sensory and shear evaluations was subjected to 0.9 s/g at 160° C in a conventional oven, 0.5 s/g in a microwave oven, or to an internal temperature of 77°C, in a conventional or microwave oven. Microwave treatment resulted in decreased glycogen metabolism but had no effect on the retention of ATP. Sensory and shear evaluations indicated that all treatments resulted in less tender samples. IFT

54

Bacon precooked by microwaves offers the potential of lowering nitrosamine levels.
Mattson, P.
Food Product Development 12 (4) 47 (1978) [En] [P. H. Mattson & Co. Inc., Burlingame, California, USA]

Westland Foods, Inc., of Concord, California are using microwaves in the preparation of precooked bacon. In the process, cured bacon bellies are blocked and sliced conventionally and then heated by microwaves to an average temp. of 240°F for approx. 4 min. Two 25 kW magnetrons are used, while preheated air strips water vapour from the heated bacon. The microwave precooked (MPC) bacon should be nitrosamine-free since the time and temp. for processing are far below the USDA threshold estimate. Westland offer MPC bacon with a wide range of moisture and fat contents and in different particulate sizes. MPC bacon is used in salad dressings, soups, dry seasonings, and other products where real bacon flavour and texture are desired. Other advantages of MPC bacon are: low plate counts; and little leaching of fat and water elements from bacon into the fat/water system when formulating pourable salad dressings. VJG

55

The effect of brief microwave treatment on numbers of bacteria in fresh chicken patties.
Cunningham, F. E.
Poultry Science 57 (1) 296–297 (1978) [6 ref. En]
[Dairy & Poultry Sci. Dep., Kansas State Univ., Manhattan, Kansas 66506, USA]

Fresh, raw chicken patties were exposed to microwaves for 0, 10, 20, or 40 s, then tested immediately for total count and coliforms. The work was repeated 4 times. Briefly exposing chicken patties to microwaves reduced their total count from 10^4 to 6×10^3 after 10 s, to 10^3 after 20 s, and to nearly 10^2 after 40 s. The 40-s treatment had some effect on meat colour (partially cooked). Coliforms were less affected than was total count, the MPN dropped from 100/10 g in the untreated meat to 50/10 g after the meat had been exposed to microwaves for 40 s. It is suggested that microwaves might be used to pasteurize raw meat products without changing other quality characteristics of the meat. AS

56

Impact of the microwave oven on family food use.
Drew, F.; Rhee, K. S.; Stubbs, A. C.
Texas Agricultural Progress 24 (2) 23–24 (1978) [En]
[Texas Agric. Exp. Sta., Texas A&M Univ., College Station, Texas 77843, USA]

20 families, ranging from 2 to 6 members, who did not originally own a microwave oven were asked to keep records of the foods they used during two 28-day periods: (i) immediately before receiving a microwave oven, and (ii) after 2 months with a microwave oven in their home. A comparison of food items used during (i) and (ii) showed no great changes in the amounts used in general; largest differences were increases in the use of potatoes (15%) and beverages (17%), specifically coffee, for (ii). Type of products used changed with (ii), with increased use of fresh meat, rather than canned, frozen or convenience items, canned rather than fresh vegetables, and instant rather than ground coffee and tea. Dishes prepared changed with (ii), with a larger % of food items used being cooked or heated before serving, an increase in baked products and a decrease in fried products, and more sandwiches, hot dogs and hamburgers, and warmed bakery products. Results show that placing a microwave cooking appliance in the kitchen will not replace the conventional cooker or special small cooking appliances, but will likely be used for a third or more of cooking tasks. SP

57

Microwave freeze-drying of food: a theoretical investigation.
Ang, T. K.; Ford, J. D.; Pei, D. C. T.
International Journal of Heat and Mass Transfer 20 (5) 517–526 (1977) [26 ref. En] [Dep. of Chem. Eng., Univ. of Waterloo, Waterloo, Ontario, Canada]

An unsteady-state analysis of 2 dimensional freeze-drying with microwave internal energy generation is carried out, taking into account the differences of the transport parameters with respect to grain orientation, such as is found in food products. The anisotropic character of the material strongly influences the temp. profiles during drying. This importance is further amplified by a coupling effect between mass-transfer resistance, specimen temp. and the absorption of microwave energy. AS

58

Food package for assuring uniform distribution of microwave energy and process for heating food.
Standing, C. N.; Brandberg, L. C. (Pillsbury Co.)
United States Patent 4 132 811 (1979) [En]

A method is described for more uniformly exposing food products to microwave energy which comprises providing a package containing a vaporizable liquid having a food-filled portion and an expandable vessel, providing contact between the vessel and the food-filled portion, exposing the food-filled portions and the vessel to microwave energy sufficient to heat the food and vaporize the liquid to cause expansion of the vaporized liquid in the vessel, the vaporized liquid causing the vessel to expand and push against the food-filled portion to change the location thereof in the oven and thereby force the food to move bodily from one position to another. IFT

59

Food package including condiment container for heating food.
Standing, C. N.; Brandberg, L. C. (Pillsbury Co.)
United States Patent 4 133 896 (1979) [En]

A package is provided for heating foods which includes a pair of bread slices, such as the halves of a hamburgers bun, at least 1 meat product, e.g. hamburgers patty, preferably resting on one of the bread slices, and a condiment package containing one or more condiments with a microwave reflective material at least partially enclosing the condiments to reduce the rate at which they absorb heat. These components are enclosed in a sealed plastics bag which is transparent to microwave energy. SP

60

Microwave/freeze-dried compressed foods.
Anon.
Food Processing 39 (7) 44–46 (1978) [En]

A new technique for the production of freeze-dried compressed foods which gives energy savings of up to 50% is described. Developed by the US Army Natick Research & Development Command, the method involves freeze-drying of the food for about 5 h to a moisture level of 15–20%. The partially dried material is then treated with microwaves, which effects an equilibriation of the moisture content, eliminating the drying to 2% and remoistening stages in the conventional method. The food may be compressed at 20% moisture, using pressures of $3.5–70 \times 10^6$ Pa to form bars or discs, which are further vaccum-dried to approx. 3% moisture. JRR

61

Special flavours can improve microwaved meals.
Anon.
Food Product Development 12 (10) 32 (1978) [En]

Investigations have been carried out to identify

complexes responsible for the flavours and aromas typical of roasted and baked products. These flavours and aromas are not developed when foods are cooked briefly at high temp., as in microwave cooking. Norda Inc., are developing a line of ingredients designed to replace these missing notes. These can be added to foods that may be prepared in microwave ovens. Products available are: an artificially flavoured beefy gravy mix designated EP-6354; an artificial roasted beef flavour (EP-6237); and an artificial pork flavour EP-2943. Other flavours with application to microwave foods include a sauteed onion flavour, a var. of browned butter flavours including savoury and sweet types, and roast chicken flavours. VJG

62

[Quality of duck meat following various culinary treatments.]

Zhabolenko, V. P.; Khlebnikov, V. I.; Talanov, P. A.; Akulich, A. A.

Izvestiya Vysshikh Uchebnykh Zavedenii, Pishchevaya Tekhnologiya No. 6, 60–63 (1978) [13 ref. Ru] [Donetskii Inst. Sovetskoi Torgovli, Donetsk, USSR]

Changes in lipids of duck meat during conventional roasting or roasting by a microwave/IR process were studied. Hydrolytic changes in the lipids were evaluated by means of the SHL factor, a measure of the relative concn. of free fatty acids, monoglycerides, diglycerides/triglycerides and phospholipids. The SHL factor of raw meat is double that of raw fatty tissue. Heating results in a considerable rise in the SHL factor of fatty tissue, but only a slight rise in that of muscle tissue. The SHL factor was not clearly influenced by roasting process used. STI

63

A microwave method for grading agricultural products.

Kashyap, S. C.; Vachon, F.

Journal of Microwave Power 14 (1) 35–39 (1979) [3 ref. En] [Nat. Res. Council of Canada, Ottawa, Ontario K1A 0R8, Canada]

A microwave method for non-contact and continuous grading of agricultural products by wt. or by vol. is described. The product items can be transported on a conveyor belt and do not have to be oriented in any particular direction. An open-ended cavity is used for a sensor, the design of the cavity and the electronic circuitry for measuring the resonant frequency are described in detail. Experimental results for grading of apples and eggs are also presented. SP

64

Changes in nutrient composition of potatoes during home preparation. I. Proximate composition.

Toma, R. B.; Augustin, J.; Orr, P. H.; True, R. H.; Hogan, J. M.; Shaw, R. L.

American Potato Journal 55 (11) 639–645 (1978) [14 ref. En, es] [Dep. of Home Economics & Nutr., Univ. of N. Dakota, Grand Forks, N. Dakota 58202, USA]

Effects of various home cooking methods (i) boiled, unpeeled for 30 min; (ii) boiled, peeled for 30 min; (iii) oven baked (425°F) for 60 min; and (iv) microwave cooked for 30 min (Russet Burbank 20 min) on the proximate composition of 4 potato var. (Katahdin, Norchip, Pontiac and Russet Burbank) were investigated. (i) did not significantly affect the ash content, but (ii) resulted in significant losses of ash ($P < 0.01$). (iii) and (iv) did not significantly affect the ash content. Changes in crude fibre during cooking were erratic. Except for Katahdin, there was a significant decrease in crude fibre in (ii) and (iii). Significant increases in DM content of tubers occurred during (iii) and (iv). Cooking did not affect protein content of Russet Burbank tubers except when subjected to microwave treatment when there was a significant increase in this constituent. No significant changes in protein content were found in Katahdin tubers regardless of cooking method used. With Norchip and Pontiac tubers there were significant decreases in protein content with (ii), (iii), and with (iv) (Norchip only). No changes in protein content were noted for (i). VJG

65

Changes in the nutrient composition of potatoes during home preparation. II. Vitamins.

Augustin, J.; Johnson, S. R.; Teitzel, C.; True, R. H.; Hogan, J. M.; Toma, R. B.; Shaw, R. L.; Deutsch, R. M.

American Potato Journal 55 (12) 653–662 (1978) [17 ref. En, es] [Food Res. Cent., Univ. of Idaho, Moscow, Idaho 83843, USA]

Details on var. and cooking methods have been outlined. [See preceding abstr.] Raw, boiled unpeeled, boiled peeled, oven-baked, and microwave-cooked potatoes were analysed for ascorbic acid, thiamin, riboflavin, niacin, folic acid, and vitamin B_6. Results are tabulated. It is concluded that retention of vitamins during home preparation of potatoes is better than 70%, provided the tubers are not cut prior to cooking and are consumed without delay after cooking. Retention values in general exceeded the 85% level for thiamin, niacin and vitamin B_6, and the 70% level for ascorbic acid, riboflavin, and folic acid. The cooking methods which in general result in the highest vitamin retention are boiling potatoes unpeeled or microwave cooking. VJG

66

Non-volatile organic acid profiles of peas and carrots cooked by microwaves.

Mabesa, L. B.; Baldwin, R. E.; Garner, G. B.

Journal of Food Protection 42 (5) 385–388 (1979) [17 ref. En] [Dep. of Food Sci. & Nutr., Univ. of Missouri, Columbia, Missouri 65211, USA]

Frozen peas and frozen carrots were obtained from a local supermarket and cooked in a consumer microwave oven (550 W of cooking power) and in an institutional microwave oven (1150 W of cooking power). Non-volatile organic acids of each vegetable were identified and quantitated by GLC. Lactic, succinic, malic and citric acids were identified in peas. Relative concn. of these acids increased after cooking.

particularly in samples cooked without water in a consumer microwave oven. Only malic acid was identified in carrots. Concn. of this acid was not affected by any cooking treatments used in the study. The non-volatile organic acids found in both peas and carrots were not correlated with the sensory scores for flavour of these vegetables. However, total non-volatile organic acids found in peas tended to be negatively correlated with the total chlorophyll retention of all the cooked pea samples. AS

67

The effect of conventional and microwave cooking on the eating quality of beef from bulls of three differing breed types.
Hawrysh, Z. J.; Price, M. A.; Berg, R. T.
Canadian Institute of Food Science and Technology Journal 12 (2) 78–83 (1979) [20 ref. En, fr] [Foods & Nutr. Div., Univ. of Alberta, Edmonton, Alberta, Canada T6G 2M8]

Effects of microwave cooking with intermittent energy application and of conventional electric heating on cooking losses and eating quality of paired beef semitendinosus (ST) roasts were determined. Beef was obtained from young bulls, representing 3 breed-types: Hereford crossbred (HC), dairy crossbred (DC) and beef synthetic (SY), which had been fed and managed under similar conditions. Cooking time and cooking losses of ST roasts were affected by cooking method, but did not appear to be affected by breed. Subjective evaluation indicated that roasts from both cooking methods were similar in internal colour, initial juiciness, softness, juiciness, flavour, residual connective tissue and overall acceptability but panelists rated roasts cooked conventionally significantly better in external colour, evenness of internal colour, texture and tenderness than those cooked electronically. Objective measurements of juiciness (water holding capacity (WHC)), tenderness (Warner Bratzler (WB) shear, Ottawa texture measuring system (OTMS) with WB blade) and softness (penetrometer) for ST roasts agreed with findings for cooking method from sensory evaluations. Trained panelists indicated that ST roasts from all breeds were similar in eating quality. There were no significant differences in WHC. WB shear values, OTMS measurements and penetrometer data attributable to breed. Thus, these studies suggest that ST roasts may be cooked using either conventional electric ovens or microwave ovens operated with intermittent energy application; and beef obtained from the 3 breed-types of young bulls was similar and judged acceptable in eating quality. AS

68

Mechanism of lethal action of 2,450-MHz radiation on microorganisms.
Vela, G. R.; Wu, J. F.
Applied and Environmental Microbiology 37 (3) 550–553 (1979) [18 ref. En] [Dep. of Biol. Sci., North Texas State Univ., Denton, Texas 76203, USA]

Microwaves can be successfully used for blanching, sanitizing, and even sterilizing many foods. In this study, various bacteria, actinomycetes, fungi, and bacteriophages were exposed to microwaves of 2450 ± 20 MHz in the presence and absence of water. It was found that microorganisms were inactivated only in the presence of water and that dry or lyophilized organisms were not affected even by extended exposures. The data presented prove that microorganisms are killed by 'thermal effect' only and that, most likely, there is no 'nonthermal effect'; cell constituents other than water do not absorb sufficient energy to kill microbial cells. AS

69

Method of preparing food items for subsequent rethermalization in a microwave oven.
Moore, D. G. (Chemetron Corp.)
United States Patent 4 126 776 (1978) [En]

Method prepares food items for subsequent rethermalization in a microwave oven. Method automatically rethermalizes previously prepared food for consumption. IFT

70

Method of automatically rethermalizing previously prepared food for consumption.
Moore, D. G. (Chemetron Corp.)
United States Patent 4 126 777 (1978) [En]

See preceding abstr.

71

Quality evaluation of microwave cooked vegetables.
Mabesa, L. B.
Dissertation Abstracts International, B 39 (2) 642: Order no. 78–14129, 245pp. (1978) [En] [Univ. of Missouri, Columbia, Missouri 65201, USA]

Effects of cooking of frozen peas and frozen carrots with or without water in (i) a domestic microwave oven (550 W cooking power) or (ii) an institutional microwave oven (1150 W cooking power) were studied. Tests were replicated 6 times. Sensory scores for flavour and colour of peas were higher in (i) than in (ii). Ascorbic acid concn. and retention were highest for peas cooked with water in (ii). Chlorophyll retention was greatest for peas cooked without water in (i); this technique also gave the highest retention of organic acids (lactic, succinic, malic and citric) in peas. Overall, (i) was better than (ii) for cooking of peas. Effects of cooking method were smaller for carrots than for peas. Carrots cooked without water had higher flavour scores and higher carotene content and retention than those cooked with water. Malic acid was the only organic acid identified in carrots; its concn. was not significantly influenced by cooking method. AJDW

72

Polychlorinated biphenyls, dieldrin and DDT in lake trout cooked by broiling, roasting or microwave.
Zabik, M. E.; Hoojjat, P.; Weaver, C. M.
Bulletin of Environmental Contamination and Toxicology 21 (1/2) 136–143 (1979) [7 ref. En] [Dep. of Food Sci. & Human Nutr., Michigan State Univ., E. Lansing, Michigan 48824, USA]

Fillets of lake trout (Salvelinus namaycush) were (i) roasted on a rack in an Al pan in a household oven at 177°C to an internal temp. of 75°C, (ii) broiled to an internal temp. of 75°C; and (iii) cooked in a Pyrex glass dish in a household microwave oven operating at high for 0.75 to 2 min. Effect of removal of skin before baking was investigated. The central portion (6 in) of each fish was used for cooking while anterior and posterior portions (1 in) were used for raw flesh analyses. PCBs varied considerably among fillets, residues ranging from 1.0 to 10.7 p.p.m. in the raw edible flesh. (i) and (ii) fillets had cooking losses of 18%, while cooking losses for (iii) were 11%. Drip losses were 6.1% for (ii). 4.0% for (iii) and 2.0% of (i). Volatile losses were 16% for (i), 13% for (ii) and 7% for (iii). Cooking significantly reduced PCB's, dieldrin and DDT in fillets and roasted trout pieces. (ii) reduced PCB's by an average of 53%, dieldrin by 48% and DDT by 39%. (i) reduced PCB's by 34%, dieldrin by 25% and DDT compounds by an average of 30%. Cooking fillets by (iii) reduced PCB's by 26%, dieldrin by 47% and DDT compounds by 54%. Broiling therefore brought about the greatest reduction in PCB's and dieldrin. Removing the skin before roasting significantly ($P < 0.05$) affected total and volatile losses but not drip losses. Roasting trout pieces without skin resulted in an average of 50% loss of PCB's, 57% of dieldrin and 57% of DDT compounds, while roasting trout pieces with skin resulted in an average of 40% loss of PCB's, 45% of dieldrin and 47% of DDT compounds from the edible flesh. VJG

73

[Use of microwaves for heat processing of sausage products.]

Zayas, Yu. F.; Boravskii, V. A.; Khromova, R. A.; Izotova, L. I.

Myasnaya Industriya SSSR No. 6, 26–27 (1978) [Ru]

[Moskovskii Kooperativnyi Inst., Moscow, USSR]

Microwaves were used to heat salami to a core temp. of 72°C. A high energy application rate led to rupture of the casing, while a low rate considerably extended the processing period. It was established that the salami needed to be processed in 2 stages, the 1st lasting 2 min, the 2nd 8 min. The whole salami was then uniformly heated, and no deterioration in finished product quality occurred. Salami treated with ultra-short waves had a high water binding capacity, and their colour and metmyoglobin formation corresponded to those of conventionally heated control samples. No microorganisms were found in the product. STI

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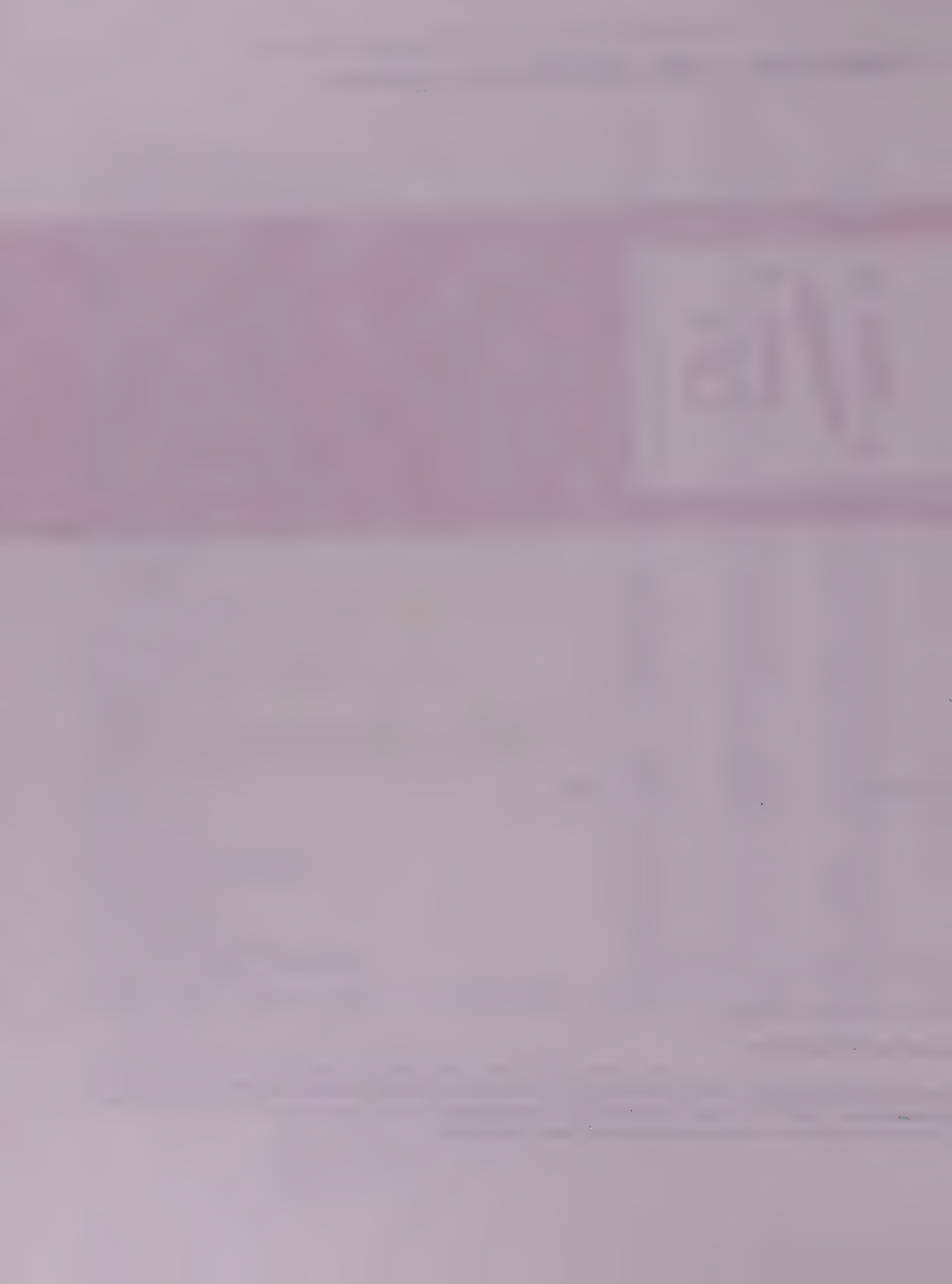
FAB 5

MICROWAVES IN FOOD PROCESSING

SELECTED FROM VOLUME 12
FOOD SCIENCE AND TECHNOLOGY ABSTRACTS

under the direction of

Commonwealth Agricultural Bureaux, Farnham Royal, Bucks; Gesellschaft fur Information und Dokumentation, Frankfurt am Main; Institute of Food Technologists, Chicago; Centrum voor Landbouwpublikaties en Landbouwdocumentatie (Pudoc), Wageningen.



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H. BROOKES

EDITOR

1

Microwave cooking.
Buck, R. G. (Litton Systems Inc.)
United States Patent 4 154 855 (1979) [En]

A method is described for controlling cooking conditions in a microwave oven by measuring the humidity in the cooking cavity at time-spaced intervals and controlling the cooking as a function of the slope of the humidity-time curve. IFT

2

Microwave baking of brown and serve products.
Schiffmann, R. F.; Mirman, A. H.; Grillo, R. J.; Wouda, S. A. (International Telephone & Telegraph Corp.)
United States Patent 4 157 403 (1979) [En]

Rolls of prepared dough in sales cartons are proofed and baked using microwave energy of specified frequency and flux density, the rolls are shrinkwrapped while hot, which increases shelf life. IFT

3

[Microwave dough products.]
Tanabe Seiyaku Co. Ltd.
Japanese Examined Patent 5 407 859 (1979) [Ja]

Dough products to be cooked by microwave heating are coated with a mixture of sugar and dihydroxyacetone to provide improved flavour and colour. IFT

4

Quality assessment of meat patties cooked by commercial preparation methods, chill stored, and microwave reheated.
Cook, A. L.
Dissertation Abstracts International, B 38 (12) 5872-5873: Order no. 78-07686, 104pp. (1978) [En] [Univ. of Tennessee, Knoxville, Tennessee 37916, USA]

Frozen, soy-extended meat patties were cooked by grilling, baking by natural convection or baking by forced-air convection, stored under refrigeration in bulk-packs and then reheated by microwaves. Studies of the patties indicated that % yields were greater and cooking losses smaller with baking than with grilling; patties tenderness (shear force index) was similar with all 3 cooking methods. Sensory analysis indicated that: patties cooked by forced-air convection had the best scores for appeareance and flavour; tenderness scores were higher for baked than for grilled patties but the differences were not significant; and mean scores for overall acceptability were not significantly different for the 3 cooking methods. JA

5

[Method and device for sterilizing foods by heating with microwaves.] Verfahren und Vorrichtung zur Sterilisierung von Lebensmitteln durch Erhitzung mittels Mikrowellen.
Karl, F.
German Federal Republic Patent Application 2 712 448 (1978) [De]

Food, e.g. milk, is sterilized by microwaves. The energy level is controlled to produce in the product a high temp. gradient and a max. temp. (e.g. <70°C in the case of milk), which does not damage vitamins and flavour compounds in the product but would kill microorganisms present. The food is then cooled rapidly. W&Co

6

Microwave oven.
Tanaka, J.; Kai, T. (Matsushita Electric Industrial Co.)
United States Patent 4 163 141 (1979) [En]

A microwave oven equipped with a rotary table driven by magnetic coupling is described. HBr

7

Microwave oven sensing system.
Buck, R. G. (Litton Systems Inc.)
United States Patent 4 162 381 (1979) [En]

A microwave oven sensing system has a humidity sensor and a temp. sensor at an exit ventilation port of the oven's heating cavity. The sensors connect to a programmable controller for comparison with stored "characteristic humidity curves" for microwave cooking of different types of foods. HBr

8

Rapid determination of cheese moisture with a home-style microwave oven.
Kipp, W. J.; Spurgeon, K. R.
Journal of Dairy Science 62 (suppl. 1) 38 (1979) [En] [S. Dakota State Univ., College Station, Brookings, S. Dakota 57006, USA]

Using a relatively inexpensive microwave oven in conjunction with a laboratory electrobalance, the optimal sample size, container size and shape, amount of power and treatment time were determined; results of replicate analyses were within 0.5-1% variation. Results of solids detn. on Swiss and Cottage cheese samples, but not on Cheddar, Mozzarella and cream cheese, compared closely with those from Mojonnier and AOAC procedures. DMK

9

Low wattage microwave cooking of top round roasts: energy consumption, thiamin content and palatability.
Voris, H. H.; Duyne, F. O. van
Journal of Food Science 44 (5) 1447-1450, 1454 (1979) [31 ref. En] [Dep. of Foods & Nutr., School of Human Resources and Family Studies, Univ. of Illinois, Urbana, Illinois 61801, USA]

6 pairs of top round beef roasts were used to compare microwave cooking at low power levels with conventional roasting. Roasts weighing 3.4-4.7 lb were cooked to an internal temp. of 68.3°C in a microwave oven or in an electric oven at approx. 149°C. Mean total cooking time, 77.6 min, and energy consumption, 0.860 kWh, for microwave cooking were significantly lower ($P < 0.01$) than the respective means, 134.8 min and 1.403 kWh, for conventional roasting. Total cooking losses, moisture, fat and thiamin contents of cooked meat, and shear and press fluid values for

semimembranosus muscles did not differ significantly due to cooking method. Microwave roasts were scored lower than conventional roasts for aroma, flavour and exterior colour; however, mean scores for tenderness, juiciness and interior colour were similar. Results of this study indicate that preparation of a less tender cut of beef in a microwave oven operating at reduced power levels yields a product which is comparable in several parameters of quality to conventional roasting. IFT

10

Rendering of material such as meat.
Bird, L. L.
United States Patent 4 168 418 (1979) [En]
A microwave apparatus for rendering meat products and blood is described. HBr

11

Problems and control of insects in rice packing.
Lim, G. S.; Tee, S. P.; Ong, L. M.; Lee, B. T.
MARDI Research Bulletin 6 (2) 119–128 (1978) [16 ref. En, my] [Malaysian Agric. Res. & Development Inst. (MARDI), PO Box 202, Serdan, Selangor, Malaysia]
Studies in Malaysia of the types and numbers of insects found in rice during storage in polyethylene bags and of the effects of the insects on rice quality are first reviewed. The studies indicated that *Tribolium castaneum* predominates but that *Sitophilus oryzae* causes the greatest damage to rice quality. Consideration is then given to studies of the effectiveness and limitations of various insect control methods applied prior to packaging and storage. The methods examined were: 'frying' which involves heating the rice in pans for 4 min (the rice is manually stirred during heating and attains a temp. of 44–45.5°C); microwave heat treatment using doses ≤2450 MHz for ≤600 s; heating on a fluidized bed at 40–90°C for 2–20 min; and fumigation with methyl bromide using doses of 32 mg/l for 3 h and of 24 mg/l for 24 h. The storage life of the rice was extended from <4 months for untreated to approx. 7 months by 'frying', to >1 yr by microwave treatment, to >6 months by fluidized bed treatment, and to 2 yr by fumigation. Limitations include the high cost of the microwave and fluidized bed methods and the possible development in the insects of a resistance to methyl bromide. JA

12

[Use of microwaves for tempering of raw material for manufacture of meat products.]
Treurniet, D. M. L.
Koeltechniek-Klimaatregeling 72 (8) 158–160 (1979) [2 ref. Nl] [Cent. voor Vleestech., CIVO-TNO, Zeist, Netherlands]
The tempering of frozen raw material for meat processing to −3°C by a Raytheon QMP 1879 batch microwave installation was compared with processing of frozen meat, thawing in water to +10°C, in air to +10°–15°C and tempering in air to −3° to 0°C. Advantages and disadvantages of the various methods, temp. achieved, energy and water consumption, and costs are shown in tables. Microwave tempering was suitable for all the raw materials examined (lean beef, pigs' tongues, pig skin, ham on the bone), was quick, caused no drip loss, no dirty wastewater and required little space. 9 min tempering of 150 kg catches of lean beef in 600 × 300 × 200 mm blocks packaged in polyethylene and cartons achieved core temp. −3° to −5°C, surface temp. +2° to +6°C and no burn. The material could be processed in large cutters. 3 min tempering of 75 kg batches of ham on the bone (not packaged) achieved core temp. of −7° to −1°C, surface temp. +20°C immediately, 0°C 5 min after tempering and no burn. The material was too cold to be boned. Energy consumption was 29.3 kWh/h for tempering, 3.0 for standby, water consumption 0.3 m^3/h. 150 kg batches of lean beef, pig's tongues and skin could be tempered in 10 min, with 5 min for charge and discharge. RM

13

The effects of curing, room temperature, and refrigerator storages followed by microwave and freezing treatments on Centennial sweet potato quality.
Hearnsberger, J. O.
Dissertation Abstracts International, B 38 (12) 5828: Order no. 78-07578, 156pp. (1978) [En] [Mississippi State Univ., State College, Mississippi, USA]
The electrical resistance of raw sweet potatoes increased during 12 days of curing storage and during 15 days of room temp. storage but generally decreased during refrigerator storage; a direct relationship was found between high resistance values and high taste panel scores. Taste panel scores indicated that the culinary quality was generally enhanced by curing and room temp. storage, while the quality was reduced after 14 days at refrigerator temp. (1°C). Colour changes were small under all storage conditions. Generally, levels of soluble solids, total sugars and reducing sugars increased during curing and room temp. storage, while the total and reducing sugars contents decreased during refrigerator storage. Microwave treatment resulted in increased levels of total and reducing sugars in sweet potatoes stored at curing and room temp. for about the first 5 days after harvest. Microwave treatment also produced small but significant increases in titratable acidity and was thought to increase α-amylase activity. Contents of total and soluble solids were increased by freezer storage and baked roots showed no significant darkening after 8 months of frozen storage. JA

14

Rapid determinations of total milk solids with a modified automated microwave oven and electrobalance.
Yoshino, M.; Hamada, H.; Takahashi, Y.
Journal of Dairy Science 62 (10) 1645–1647 (1979) [4 ref. En] [Dep. of Anim. Products, Nat. Inst. of Anim. Ind., Aoba-cho, Chiba-city, Japan]
A description is given of the TMS-Checker Model K378A Auto (Anritsu Electric Co. Ltd.) which is equipped with an automatic sampling device and several other features that help to attain quick and even drying of the sample. Repeatability as assessed by s.d. for 30 replicate estimations on milk was 0.023% TS, compared with 0.022% for the gravimetric reference

method. Accuracy of the K378A on 150 samples of milk was 0.023%, this being the s.d. from the regression of K378A against the gravimetric estimations. The operating speed of 95 s/detn. makes this instrument suitable for analysis of milk samples for milk payment schemes. MEG

15

Method of cooking meats in a microwave oven.
Buck, R. G. (Litton Systems Inc.)
United States Patent 4 171 382 (1979) [En]

The method involves determining the mean internal temp. of the meat (indicative of the internal 'doneness' of the meat) as a function of sensed and sampled time-dependent humidity and temp. of the microwave oven heating cavity. The mean internal temp. of the meat is determined as a function of the initial temp. of the meat; a net heat loss due to surface evaporation; a net input of energy by the microwave power source; and a net convective heat loss. AS

16

Microwave cookery of beef patties: browning methods.
Drew, F.; Ki Soon Rhee
Journal of the American Dietetic Association 74 (6) 652-656 (1979) [13 ref. En] [Consumer Res. Cent., Texas Agric. Exp. Sta., Texas A&M Univ., College Station, Texas, USA]

A study was carried out of 4 browning methods in microwave cookery of meat (beef patties). Cooking treatments were: (i) microwave (115V, 545 W, 2450 MHz), (ii) microwave with browning grill; (iii) microwave and browning element (1500 W); (iv) microwave and broiler (2400 W); (v) combination range oven (271 W, 2450 MHz; conventional cooking at 232°C); and (vi) conventional electric oven at 163°C. Total cooking time was increased by all 4 methods used to brown the beef patties in microwave cookery. Increases ranged from 51 to 71% over (i). Extra energy used for browning increased the total fuel use by 53 to 87% over (i). Fuel was used in increasing amounts in the following order (i), (ii), (iii), (iv) and (v). Patties cooked by (ii) had the smallest total cooking loss and were also lowest in losses of total drip and lipid drip. Greatest cooking loss occurred with (iii). Drip loss was highest from patties cooked by (i). Of the treatments used (iii) and (v) produced products which rated highest for appearance but lowest for juiciness and tenderness. Patties cooked on (ii) were rated highest for juiciness and tenderness. There was no significant difference among patties cooked by various methods for flavour and overall acceptability. VJG

17

Microwave ovens as aids to fast food service.
Mann, S.
British Baker 176 (48) 22-24 (1979) [En]

Topics discussed include: characteristics of the microwave oven and how it can best assist the caterer; maintenance and cleaning of microwave ovens; and operation of microwave ovens. SP

18

Survival of pathogenic bacteria in foods prepared in a microwave oven.
Fruin, J. T.; Guthertz, L. S.; Sauberlich, H. E.
Abstracts of the Annual Meeting of the American Society for Microbiology 79, 216 (1979) [En] [Letterman Army Inst. of Res., Presidio of San Francisco, California 94129, USA]

To assess the destructive effect of microwave cookery on pathogenic bacteria, strains of *Escherichia coli, Clostridium perfringens, Streptococcus faecalis,* and *Staphylococcus aueus* were used to inoculate a meat loaf preparation. After inoculation, a sample was withdrawn for bacteria analysis and the remainder of the meat loaf was divided and cooked via microwave, conventional, and slow cookery. The temp. of the meat loaf was recorded at various locations immediately after cooking to obtain min., max. and mean temp. for each loaf. Also, just after cooking, representative samples were taken and analysed by conventional means for the specific bacteria and for total bacterial content. Survival % were calculated and plotted against temp. for each cooking method. Temp. variation within the loaf was greatest for those cooked with microwaves and smallest for those cooked by the slow method. For each bacterium and the total count, the destructive effect of cooking was greatest for the slow cooker and least for the microwave cooking method. AS

19

Making the microwave oven all-purpose would lead to wider frozen food use.
Martin, S.
Quick Frozen Foods 40 (9) 55-57, 59-62 (1978) [En]

The innovations of Mel Levinson of the Electronic Centre, Elizabeth, New Jersey which permit frozen pizza to be successfully heated in a microwave oven, meat and fruit pies to be properly and thoroughly baked, frozen dinners to be heated satisfactorily, are discussed. The pizza is cooked in a microwave oven on a metal, ventilated grill which is placed on a metal pot containing small pieces of odourless, smokeless charcoal which have been heated to glowing in the oven before putting the pizza in. A transparent pyrex lid is placed over the pizza. The pizza takes a few min. to heat. The burning charcoal emits gases whose temp. is much higher than a conventional pizza oven. The burning charcoal raises the top and bottom surface of the frozen product to 350° or 450°F browning temp. in the few min. it takes for the microwaves to defrost and bake the inside. Fruit and meat pies and frozen dinners may be heated in a porous paper tray, sealing the top with plastics capable of taking oven temp., and then heating in the microwave oven. VJG

20

Microwave browning.
Buck, R. G. (Litton Systems Inc.)
United States Patent 4 181 744 (1980) [En]

A method is described for imparting a browned appearance to the surface of food in a microwave oven having air circulation in which the humidity is automatically sensed and controlled to provide

optimum humidity conditions for surface browning. IFT

21

Are ovenables all talk?
Covell, P.
Packaging Review, UK 100 (2) 67, 69-72 (1980) [En]

The author surveys developments in and potential markets for ovenable boards as an alternative to foil for use in microwave ovens. 3 types of ovenable board are available currently: extrusion-coated, clay-coated and water based acrylic-coated SBS board. Board is said to perform considerably better than Al foil for microwave heating. HBr

22

[Studies on the production of soaked rice of high moisture level by microwave treatment.]
Kubota, K.; Hironaka, K.; Hosokawa, Y.; Suzuki, K.; Hosaka, H.
Journal of Japanese Society of Food Science and Technology [Nippon Shokuhin Kogyo Gakkaishi] 25 (11) 641-644 (1978) [8 ref. Ja, en] [Dep. of Food Chem. & Tech., Fac. of Fisheries & Anim. Husbandry, Hiroshima Univ., Fukuyama-shi, Hiroshima-ken, Japan]

Studies on manufacture of soaked rice with a high moisture content, which can easily be weighed and packaged, are described. Whole raw rice (moisture content 14%) was soaked for 2 h at 30°C; the soaked rice (moisture content 32%) was treated for 75 s, at 240 W/7 g soaked rice, in a microwave oven. The microwave-treated soaked rice (moisture content 31%) was then re-soaked at 30-90°C. The resulting hydrated rice (moisture content up to 55-60%) had paste characteristics similar to those of soaked superheated steam-treated rice. [From En summ.] AJDW

23

Microwave technology points to creative routes for new product ideas, developments.
Moore, K.
Food Product Development 13 (7) 36-37, 44 (1979) [En]

The key attributes of microwave cooking are first discussed. New product ideas which take advantage of microwave characteristics are considered. These include: a 3-layer canned dinner which heats from the top down, permitting each meal component to reach a different temp.; a dessert which also heats from the top, with a metal container shielding the ice cream to allow a hot sauce over a cold base; pre-cooked pancakes with margarine, syrup and fruit packed in paperboard boxes which acquire a homemade taste when heated in a microwave oven; the use of an edible film to separate sauce from crust; and the need for browning agents. VJG

24

Single-serving pie slices held in tray, styrene dishes.
Anon.
Food Product Development 13 (8) 72 (1979) [En]

Chef Pierre Inc., of Traverse City, Michigan use a combination of styrene trays within a paperboard carton to hold individual frozen, fruit pie slices. The packages contain 3 slices of pie with a total net wt. of 12 oz. Retail prices range from $1.29 to $1.79 for var. including cherry, apple, pecan and peach pies. Single pie pieces rest in wedge-shaped, thermoformed, oriented polystyrene dish. The individual, pre-baked pie slices can be ready in 45 s in a microwave oven. VJG

25

Concentrated energy microwave appliance.
Teich, W. W.; Bowen, R. F.; Freedman, G.; Martel, T. J.; Dudley, K. W. (Raytheon Co.)
United States Patent 4 156 806 (1979) [En]

An appliance for heating seeds, nuts, grains and the like, e.g. popcorn kernels, by microwave radiation comprises a bowl which is transparent to microwave energy and which has in its lower region an area of restricted size for holding unheated kernels in a clump. The area of the bowl above the restricted area is larger to allow heated kernels to expand. Means for concentrating the microwave energy upon the clump of kernels are also incorporated. AS

26

Seed heating microwave appliance.
Bowen, R. F.; Freedman, G.; Teich, W. W.; Martel, T. J.; Eves, E. E. (Raytheon Co.)
United States Patent 4 158 760 (1979) [En]

See also preceding abstr.

27

Microwave pizza bows in test market; new protein system makes crispy crust.
Moore, K.
Food Product Development 13 (10) 20 (1979) [En]

Dob Food Products Co. have solved the problems of microwave pizza, i.e. tough or soggy crust and uneven cooking. They have created a protein system that, when mixed in specially adapted equipment, changes to a molecular form suitable for microwave use. This produces a crust with highly acceptable tender bite. The crusts are pre-baked, which gives better appearance and proper moisture control. Gino's Pizza consists of 4 individually wrapped, 4-oz pizzas topped with pizza sauce, cheese and pepperoni and packaged in a waxed paperboard carton. Each cooks from the frozen state in approx. 2 min. Although designed for microwave use, they can be cooked in conventional ovens. VJG

28

[Ultra-high frequency heating of meat products.]
Khlebnikov, V. I.; Rogov, I. A.
Myasnaya Industriya SSSR No. 9, 35-38 (1979) [6 ref. Ru] [NPO "Kompleks", USSR]

Ultra-high-frequency (microwave) heating is widely used in the meat industry, e.g. in processing of smoked meat products, sterilization of canned comminuted meat products, manufacture of meat paste products, blanching of meat products, and processing of dried poultry products. Microwave treatment of meat products is discussed in detail, with reference to the theoretical basis of several microwave heating processes, and design of a microwave heating line for processing of meat products. STI

29

Browning agents find niche in microwave cooking market.
Anon.
Food Product Development 13 (7) 34–35 (1979) [En]

Details are given of 3 products designed to brown, flavour and tenderize microwaved foods. These are: Microwave Browning Sauce by Jan U Wine Foods, Inc., of Los Angeles; Natural Browner from E-Z Pour Corporation, Wheeling, Illinois; and Micro-Shake from Micro-Shake Foods Inc., of Malibu, California. Basic ingredients, method of preparation, applications and marketing of these browning agents are considered. VJG

30

Hickory wood cooking plank.
Portman, H. F.
United States Patent 4 183 291 (1980) [En]

A hickory wood cooking plank for broiling or baking meats, fish, poultry and the like in conventional home ovens features a unique, Al support stand, provided in the form of a pair of L-shaped Al elements which serves the dual function of supporting the cooking plank and dissipating the heat from the plank to prolong useful life. HBr

31

[Continuous measurement and control of moisture content of food products using a microwave method.]
Kraszewski, A.
Prumysl Potravin 30 (9) 497–501 (1979) [6 ref. Cs, ru, en] [Zaklad Doswiadczalny 'Wilmer' PAN, Zielna 39, 00-108 Warsaw, Poland]

The principles and applications of microwave measurement of moisture content are described and illustrated by diagrams of equipment and graphs of measurements. The through-transmission method selected operates in the 3–30% range of moisture content with an accuracy of ±0.3% moisture. Experimental data for cocoa, dried milk, wheat, pasta, barley, oats, dried potato, and margarine are graphically presented. [See also FSTA (1978) 10 9M775 & (1979) 11 6M662.] SKK

32

Report shows need for special packaging for microwave-ready convenience foods.
Anon.
Quick Frozen Foods 40 (12) 24–26 (1978) [En]

The selection of frozen convenience foods for microwave heating is limited due to the unsuitability of most current packaging. The need to develop a new and probably unique package is discussed. The suitability of the differential heating container or DHC, a container on sleeve of metal or of plastics material opaque to microwave energy, with a form of shielding to reflect and control the microwave energy, is discussed. The DHC sleeve allows the correct amount of energy to reach each of several different types of food on one tray, so that those that tend to heat faster, such as vegetables, will take as long as those that would take longer; such as meat. A DHC, designed by Teckton, Inc., of Waltham, Massachusetts permits the insertion of a tray filled with portions of meat, a starch food, vegetable, salad, roll and butter, and ice cream. After the proper time in the microwave oven, the meat and complements would be at 140°F while the ice cream remained unmelted, the salad stayed crisp, and roll was warm. Another approach considered is a plastics container package utilizing metal ink for accurate shielding. VJG

33

Developing foods for microwave ovens.
Morris, C. E.
Food Engineering International 4 (10) 29–32, 35–38 (1979) [En]

Products developed by several USA manufacturers for heating by microwave ovens, and which in some cases are compatible with conventional ovens, are surveyed. Innovations in package design to improve heating of liquid foods, and to allow escape of moisture from food components that should be crisp (e.g. pizza bases) are described. Packaging materials preferred by different manufacturers, aspects of formulating recipes for microwave cooking, and actual and estimated sales of microwave ovens in the USA are discussed. Foods covered include pancakes, pizzas, popcorn, stews, complete meals and fruit pies. DIH

34

[Oxidative, hydrolytic and microstructural changes in fat after microwave heat treatment.] [Lecture]
Deniskina, T. G.; Zharinov, A. I.; Pismenskaya, V. N.; Rogov, I. A.; Tinyakov, G. G.; Yasyreva, V. A.
Proceedings of the European Meeting of Meat Research Workers No. 24, J8:1–J8:6 (1978) [6 ref. Ru, de, en, fr] [Moskovskii Tekh. Inst. Myasnoi & Molochnoi Promyshlennosti, Moscow, USSR]

Beef and pig kidney fat were rendered by heating to 80°C (i) in a microwave apparatus at 2450 MHz and 0.9 kW for 4.5 min, or (ii) similarly at 1.5 kW for 3.5 min, or (iii) by a customary procedure under atm pressure. The rendered fats were stored at 4–6°C for 12 months, and acid, peroxide, I, and thiobarbituric acid values were determined at intervals; the fats were examined for presence of conjugated double bond diene acids, and microstructure of fixed and stained preparations was studied. The results are graphically presented in detail; photomicrographs are also presented. No significant effect was found of method of rendering on changes in the fat characteristics studied during storage. [See FSTA (1980) 12 8S1280.] SKK

35

Precooked bacon offers higher yields, better flavor, reduced nitrosamines.
Anon.
Food Product Development 13 (10) 34, 36 (1979) [En]

Westland Foods of Concord, California produce cool-cooked bacon, a product precooked by microwaves during processing. Cool-cooking is an in-plant combination of microwave and conventional heating that cooks the product throughout without raising the temp. in any portion to >240°F. With current 120 p.p.m. nitrite bacon the process forms

almost no nitrosamines. Fewer volatiles are driven off and aroma and flavour are better, as are fat stability and colour. Strips do not shrink as much, distort, burn or speckle. Cool-cooked bacon, at a yield of 20–25 slices/lb, looks about the same on a plate as regular 16–18 count bacon. In other words, 10–30% less raw bacon produces the same end result. Cool cooked sandwich bacon is 35 count. Processing utilizes an industrial-sized microwave unit with two 25 kW magnetrons used in conjunction with conventional heating. 2 heating systems have been used successfully – one employs microwaves and hot air simultaneously; the other uses steam, hot air and finally microwaves. Generally the precooked product is down to 30% of its starting wt. The precooked bacon is generally shipped frozen. To serve, the bacon is broiled for 60 s or grilled for 90 s. It can be cooked in a 400°F oven for 1½–2 min. Cool-cooked bacon promises to alleviate the nitrosamine problem and offers costs savings by increasing yields up to 30%, improving shelf life and improving bacon flavour and aroma on the consumer's plate. VJG

36

Understanding microwaves – problem-solving key in developing foods for growing market.
Schiffmann, R. F.
Food Product Development **13** (7) 38, 40 (1979) [En] [Schiffmann Associates, New York, USA]

Problems in microwave cooking relate to the oven, the food and the packaging or utensils. Problems with the oven are: lack of standardization i.e. lack of equivalent nomenclature and power levels for ovens built by >30 manufacturers; and lack of uniformity of the microwave patterns in the ovens resulting in hot and cold spots. Problems with the food are: the ambient air remains cold, leading to cooler surface and warmer interior temp.; browning is also difficult unless long cooking times are encountered; and uniform heating is more difficult for irregularly shaped products. The problems of packaging foods for microwave heating are considered and also new materials such as coated paperboard which may be used. VJG

37

Cook/chill foodservice system with a microwave oven: quality of food after microwave-heating.
Dahl, C. A. B.
Dissertation Abstracts International, B **40** (7) 3078–3079: Order no. 79-27167, 296pp. (1980) [En] [Univ. of Wisconsin, Madison, Wisconsin 53706, USA]

Cook/chill foodservice systems in hospitals frequently use microwave ovens to heat portioned, precooked food immediately before serving to patients. Wide ranges found in the centre, internal end temp. of such foods after microwave heating has raised doubts as to the constancy of the microbiological and nutritional quality of food prepared in these cook/chill systems. Studies were made of the range of the centre, internal end temp. of portioned, precooked foods (beef loaf, reconstituted dehydrated potatoes, frozen and canned beans) subjected to microwave heating and of the microbiological and nutritional quality of these foods. An energy accounting model of the microwave oven subsystem was also developed; a wattmeter and various thermal calculations were used to develop the model. Observations on the foods were conducted during food product flow and before and after microwave heating. Ranges in the end temp. ($\leq$46°C) and in the quantity of aerobic mesophilic bacteria ($\leq 10^5$ colony-forming units/g) were observed after microwave heating. The quantity of added *Staphylococcus aureus* and *Streptococcus faecium* decreased as time of microwave heating increased, while the proportion of injured to uninjured bacteria generally increased as heating time increased. Of the total 30% loss of thiamin from beef loaf, approx. 10% was accounted for by microwave heating. JA

38

Microwave sealing of thermoplastic material.
Bright, M. L., Jr. (W. R. Grace & Co.)
United States Patent 4 188 769 (1980) [En]

A process is described in which plastics bags are sealed by subjecting the gathered opening to a source of microwave energy. IFT

39

[Use of microwaves for blanching of strips of celery.]
Varoquaux, P.; Sauvageot, F.; Chapon, M.; Dupuy, P.
Annales de Technologie Agricole **28** (4) 387–395 (1979) [9 ref. Fr, en] [Dep. de Tech. des Produits Vegetaux, INRA, 17, rue Sully, BV 1540, 21034 Dijon Cedex, France]

Strips of celery (cross-section 1.5 × 1.5 mm) were subjected to microwave blanching at 915 MHz in a 500 W oven for 90–130 s, reaching final temp. ranging from 88.3° to 94.1°C. The strips were then canned (by a hot-pack process at 90–95°C) in NaCl/acetic acid/citric acid/ascorbic acid brine. Control samples were canned without blanching. Drained wt., instrumentally evaluated texture and organoleptic properties were determined after storage for 8 months. Drained wt. increased with increasing microwave blanching time up to 120 s, then decreases slightly. The sample microwave-blanched for 120 s was the most crisp; the unblanched control was the least crisp. Microwave blanching improved colour and organoleptically-evaluated texture. Control samples had slightly better flavour and taste than microwave-blanched samples; all samples were, however, acceptable. Advantages of industrial application of microwave blanching of vegetables are briefly discussed. AJDW

40

Optimum cooking times for flavor development and evaluation of flavor quality of beef cooked by microwaves and conventional methods.
Bodrero, K. O.; Pearson, A. M.; Magee, W. T.
Journal of Food Science **45** (3) 613–616 (1980) [En] [Dep. of Food Sci. & Human Nutr. & Anim. Husbandry, Michigan State Univ., East Lansing, Michigan 48824, USA]

Beef *longissimus dorsi* roasts weighing 200 g, and cooked by microwaves or conventional methods for various times were evaluated for flavour and overall acceptability by an untrained panel. Analysis of the data by surface response methodology was utilized to

ascertain optimum cooking times for flavour development. The optimum cooking time for conventionally roasted (electric oven at 177°C) meat was predicted to be 88 min as compared to 280 min for samples cooked by microwaves (2450 MHz). Samples cooked by conventional roasting generally received higher scores for acceptability and flavour than those cooked by microwaves. Flavour dilution profiles for aqueous extracts of the samples revealed that the conventionally cooked samples were rated slightly stronger in flavour, more pleasant and more meaty than samples cooked by microwaves. IFT

41

Cook/chill foodservice system with a microwave oven: thiamin content in portions of beef loaf after microwave-heating.
Dahl, C. A.; Matthews, M. E.
Journal of Food Science 45 (3) 608-612 (1980) [En] [Dep. of Food Sci., Univ. of Wisconsin, Madison, Wisconsin 53706, USA]

2 heat processes were used to simulate preparation of beef loaf as would occur in hospital cook/chill foodservice systems. Thiamin content of beef loaf was evaluated before initial cooking; after initial cooking to 63-66°C and 24 h chilled storage at 6°C; and after 0, 20, 50, 80 or 110 s of microwave-heating (2450 MHz; 1408W output). Values for thiamin, determined using a fluorometric method, were adjusted to account for wt. losses after 2 heat processes and storage of the beef loaf. A decrease in thiamin content (mean 0.9 μg thiamin/g beef loaf uncooked) was not related to time or end-temp. of microwave-heating. Microwave-heating accounted for ⅓ of the 30% total thiamin loss. IFT

42

Comparison of effects of sublethal microwave radiation and conventional heating on the metabolic activity of *Staphylococcus aureus*.
Dreyfuss, M. S.; Chipley, J. R.
Applied and Environmental Microbiology 39 (1) 13-16 (1980) [24 ref. En] [Dep. of Food Sci., Ohio State Univ., Columbus, Ohio 43210, USA]

Attempts were made to characterize some of the effects of sublethal microwave radiation (MR) on cells of *Staphylococcus aureus*. Cultures were exposed to MR for 10, 20, 30 and 40 s. Effects of a conventional heat treatment (CHT) were also compared by placing flasks containing cultures in a boiling water bath for the time required to reach temp. equivalent to those found in MR cultures. Control, MR and CHT cultures were centrifuged, pellets were resuspended in distilled water, and the resulting suspensions were passed through a French pressure cell. Cell lysates and walls were then isolated and assayed for enzymic activity. Thermonuclease production was also determined at various levels of exposure of cells to MR. Activities of malate and α-ketoglutarate dehydrogenases, cytochrome oxidase, and cytoplasmic ATP were higher in MR cells than in control cells. Membrane ATP, alkaline phosphatase, and lactate dehydrogenase activities were unaffected, and activity of glucose-6-phosphate dehydrogenase was decreased by exposure of cells to MR. In CHT cells, activities of glucose-6-phosphate and malate dehydrogenases and cytoplasmic ATP increased, activities of α-ketoglutarate and lactate dehydrogenases decreased, and alkaline phosphatase activity remained unaffected. Increased levels of thermonuclease activity were observed when cells were exposed to MR for 10 or 20 s. Data indicate that microwave radiation affects *S. aureus* in a manner which cannot be explained solely by thermal effects. AS

43

[Applications of microwaves for food processing.] Die Mikrowellentechnik in der Lebensmittelverarbeitung.
Reuter, H.
Gordian 80 (3) 44-50 (1980) [10 ref. De] [Bundesanstalt für Milchforschung, Kiel, Federal Republic of Germany]

This review explains the principles of microwave treatment and discusses its applications in food processing (thawing of frozen products, heat preservation, baking, drying) giving examples. RM

44

Microwave heating package and method.
Turpin, C. H.; Hoese, T. C. (Pillsbury Co.)
United States Patent 4 190 757 (1980) [En]

The invention provides a distribution and heating method for foodstuffs and an inexpensive disposable microwave shipping, heating and serving package for food, composed of a paperboard carton and a glossy microwave energy absorber which becomes hot when exposed to microwave radiation, with subsequent conductive heat transfer to the food. HBr

45

Corn popper with butter dispenser.
Martel, T. J.; Freedman, G.; Bowen, R. F.; Teich, W. W. (Raytheon Co.)
United States Patent 4 166 208 (1979) [En]

Means are provided for heating and melting butter simultaneously with the corn popping process in a microwave corn popper, and for applying the melted butter either simultaneously with the popping process, or subsequently if desired. EJM

46

[Intensifying defrosting by use of microwave energy.]
Vavrik, A.
Prumysl Potravin 30 (7) 413-415 (1979) [6 ref. Sk, ru, en] [Vyskumny Ustav Potravinarsky, Bratislava, Czechoslovakia]

Experiments were carried out on the use of microwave heating for defrosting blocks of butter (25.4 kg) at −14° to −18.2°C initial temp. The defrosting to +6°C took 18 min, and it is calculated that to defrost of block of butter (from −18° to +15°C) would require 2.22 kWh costing 0.77 Kcs. FL

47

Effects of microwave cooking rate on palatability of pork loin chops.
Hines, R. C.; Ramsey, C. B.; Hoes, T. L.

Journal of Animal Science 50 (3) 446-451 (1980) [17 ref. En] [Texas Tech. Univ., Lubbock, Texas 79409, USA]

12 loins from 6 pork carcasses provided 216 chops, 1.9 cm thick, which were used to study the effects of broiling and 4 cooking rates in 2 microwave ovens on cooking and palatability traits. The 4 control settings for the microwave ovens and the respective power outputs (W) were low (205), medium (270), roast (350) and high (505). Cooking time for sets of 3 chops was 57.4 min/kg for broiling and decreased from 49.4 to 18.4 min/kg as microwave (MW) cooking rate increased from low to high. Drip loss of the chops did not differ among cooking methods, but evaporative and total losses were highest for broiling ($P < 0.05$) and second highest for the low MW setting. Sensory panel flavour score was highest ($P < 0.05$) for broiled chops but did not differ among MW treatments. Juiciness score was highest for the chops cooked at the low MW setting but did not differ among the other cooking treatments. Tenderness tended to vary inversely with MW cooking rate. Broiled chops were comparable in tenderness to those cooked at the low MW setting. Overall acceptability was lowest for chops cooked at the high MW setting and did not differ ($P \geq 0.05$) among the other treatments. Pigs from which the chops were obtained were a significant source of variation in all traits studied except flavour score, cooking time and protein contents of the cooked muscle. The animal × cooking method interaction was significant only for cooking losses and proximate composition. Overall, the high MW setting tended to produce the least desirable cooked product and the low MW setting and broiling the more desirable products. AS

48

[Microwave techniques for food processing.] Die Mikrowellentechnik in der Lebensmittelverarbeitung.
Reuter, H.
Schriftenreihe des Agrarwissenschaftlichen Fachbereichs der Universität Kiel No. 60, 215-224 (1979) [5 ref. De] [Inst. für Verfahrenstech., Bundesanstalt für Milchforschung, Kiel, Federal Republic of Germany]

Application of microwave technology in the food processing industry is discussed, with reference to: basic principles of dielectric heating; depth of penetration; non-thermal effects of microwaves; effects of electromagnetic radiation on humans; microwave heating equipment; microwave thawing of frozen foods; microwave processes for thermal preservation of foods; microwave baking; microwave drying processes; and economics of microwave processing techniques. AJDW

49

Microwave energy cooking bag.
Leveckis, A. S.; August, G. (Procter & Gamble Co.)
United States Patent 4 196 331 (1980) [En]

An improved microwave energy cooking bag is described having microwave energy moderating wall portions including electrically conductive sheet material which is substantially fully perforated with a multiplicity of apertures of predetermined sizes with respect to a predetermined nominal frequency of microwave energy and in which the sheet material has some face-to-face areas. IFT

50

[Pressware tray packs for use in microwave ovens.] Pressware: Traypackung für Mikrowellenherde.
Anon.
Verpackungs-Rundschau 31 (2) 179 (1980) [De]

'Pressware' extruded cellulose pulp tray packs for foods, manufactured by the International Paper Co., are briefly discussed. Bakery products (including yeast-raised types), prepared meals etc. can be cooked or reheated in these trays in microwave or conventional ovens. Use of Pressware trays for cooking of meals in conventional ovens permits a reduction of ≤20% in cooking time or temp. compared to Al trays. Pressware trays are less susceptible to denting or deformation than Al trays. Costs of Pressware and Al trays are currently comparable; it is suggested that price trends will result in Pressware trays becoming cheaper than Al trays. IN

51

Baking oven.
Remy, R.
UK Patent Application 2 026 297 A (1980) [En]

An oven for the automatic baking of bread employs both IR and microwave heating and includes jets for the application of steam to the dough to be baked. IFT

52

Meat cooking.
Harkins, J. L.
United States Patent 4 201 796 (1980) [En]

Meat portions are cooked by sealing the surface with a well-defined pencil flame of high velocity burning gas, after which the meat is cooked to a greater depth in a microwave oven. IFT

53

Vitamin retention in cooked, chilled, and reheated potatoes.
Augustin, J.; Marousek, G. I.; Tholen, L. A.; Bertelli, B.
Journal of Food Science 45 (4) 814-816 (1980) [En] [Food Res. Cent., Univ. of Idaho, Moscow, Idaho 83843, USA]

Retention of several water-soluble vitamins in baked and rehydrated mashed potatoes during cooking, chilling, and microwave-reheating was evaluated. With baked, chilled, and reheated potatoes, overall retention values ranged from near 100% for thiamin, riboflavin, and niacin to near 70% for ascorbic acid and folic acid. Losses of these 2 vitamins occurred during most of the handling steps. Retention of vitamin B_6 was significantly reduced only during the oven-baking process. Overall vitamin retention of rehydrated cooked, chilled, and reheated potato granules ranged from >90% for riboflavin, niacin, and vitamin B_6 to 86% for ascorbic acid and folic acid. In general the largest reduction in retention took place during the initial preparation of the mashed potatoes from dehydrated granules and to a

lesser degree during microwave-reheating of the chilled product. IFT

54

Dairy products analysis. Is the answer microwave or infrared analyzers?
Anon.
American Dairy Review **42** (4) 20–22 (1980) [En]

Commercial microwave equipment for determining moisture, and IR equipment for multiple analyses are outlined. Both give fast results for the analysis of dairy products. A checklist is given to help in the selection of equipment appropriate to the requirements of a dairy. JMD

55

Differences among top round steaks cooked by dry or moist heat in a conventional or a microwave oven.
Moore, L. J.; Harrison, D. L.; Dayton, A. D.
Journal of Food Science **45** (4) 777–781 (1980) [En]
[Kansas Agric. Exp. Sta. Kansas State Univ., Manhattan, Kansas 66506, USA]

Top round steaks were cooked by dry or moist heat in conventional or microwave ovens with rotary hearths. Gardner colour-difference values and final temp. data demonstrated that a steak is heated more evenly by conventional, dry heat than by conventional moist or by microwave dry or moist heat. Cooking time, volatile cooking losses, total moisture, and sensory juiciness and tenderness scores were less ($P < 0.001$), whereas total and drip cooking losses ($P < 0.001$) and ether extract ($P < 0.05$) were more for steaks cooked by microwaves than for conventionally cooked steaks. Cooking time was greater ($P < 0.001$), but total and drip cooking losses were less ($P < 0.001$), for steaks cooked by dry heat than for those cooked by moist heat. IFT

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FAB 5

MICROWAVES IN FOOD PROCESSING

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H. BROOKES

EDITOR

1

Nutritional evaluation of soy-banana, whole soy flour and microwave-processed whole soybeans.
Hill, P. R.
Dissertation Abstracts International, B 40 (8) 3645: Order no. 80-04189, 187 pp. (1980) [En] [Univ. of Illinois, Urbana, Illinois 61801, USA]

Feeding trials with rats, involving detn. of wt. gain and protein efficiency ratio, were used to assess the protein nutritive value of: (i) a weaning food prepared from whole soybeans and ripe bananas and processed by drum- or freeze-drying; (ii) whole soy flour processed by drum- or freeze-drying; and (iii) microwave-processed whole soybeans presoaked to 20, 40 or 60% moisture in 0.5% $NaHCO_3$ solution. Some samples of the 3 foods were supplemented with methionine and/or lysine. It was concluded from the results of trials with (i) and (ii) that reducing sugars in bananas could react with the epsilon-amino group of lysine during drum-drying of (i) thus rendering some of the lysine biologically unavailable; this problem was overcome by lysine supplementation. A deficiency of S amino acids in the foods was overcome by methionine supplementation. Studies with (iii) indicated that wt. gains and protein efficiency ratios increased with increasing moisture contents and also with lysine and methionine supplementation; these results suggest that loss of biologically available lysine increased with decreasing moisture content. Further studies indicated that diets based on (iii) did not produce abnormal lipid accumulation in rat liver and that most trypsin inhibitor activity was destroyed by processing. JA

2

Kinetics of the thermal fracturability loss of edible plant tissue and microwave sterilization as a means to improve the fracturability retention of heat processed vegetables.
Loh, J.
Dissertation Abstracts International, B 40 (9) 4188: Order no. 80-06643, 187 pp. (1980) [En] [Univ. of Minnesota, Minneapolis, Minnesota 55455, USA]

The rate of textural change during thermal processing of 11 fruits and vegetables was examined in an attempt to verify the first-order kinetic model. Potato tissue was used to study within-species variations of the rate constant and the activation for heat-induced fracturability loss against 9 independent variables. The versatility of the model was evaluated for use within species. Potato and water chestnut tissues were used for comparing between-species differences in heat-softening rate and thermal sensitivity along with mode of chemical changes and histological differences in order to explain mechanisms of fracturability loss during cooking. Kinetic data showed much smaller Q_{10} values for thermal fracturability loss in vegetables than for thermal inactivation of microorganisms. It is therefore concluded that a HTST cooking method, such as microwave sterilization, seems applicable to provide chunky and shelf-stable preserved vegetables. JA

3

[Complex thermal modification of wheat flour by graded microwave processing.] Komplexe thermische Modifizierung von Weizenmehl durch abgestufte Mikrowellenbehandlung.
Dörfer, J.; Eckert, I.
Bäcker und Konditor 28 (3) 68-71 (1980) [12 ref. De] [Inst. für Getreideverarbeitung der DDR, Bergholz-Rehbrücke, German Democratic Republic]

500 g samples of wheat flour (moisture content (13.5%) were heated in a 2 kW microwave oven (operating at 2375 MHz) for 0, 15, 30, 45, 60, 75 or 90 s; 1000 g samples of flour were microwave heated for 120 s. Technological properties of the heated flours were evaluated on the basis of moisture content, molecular parameters of the flour proteins, α-amylase activity, starch damage and farinogram and amylogram data. Microwave heating for ≤ 30 s improved the rheological properties of the dough and final product quality; longer heating times impaired quality, mainly as a result of effects on protein solubility, gluten formation and amylase activity. IN

4

Cook/chill foodservice system with a microwave oven: aerobic plate counts from beef loaf, potatoes and frozen green beans.
Dahl, C. A.; Matthews, M. E.; Marth, E. H.
Journal of Microwave Power 15 (2) 95-105 (1980) [41 ref. En] [Dep. of Food Sci. & Human Nutr., Michigan State Univ., East Lansing Michigan 48823, USA]

Microbiological quality and end temp. (ET) of portioned food after heating in a microwave oven as used in a hospital cook/chill foodservice system were evaluated. Beef loaf (15 kg), potatoes (6 kg), and green beans (5 kg) were prepared in a laboratory. After initial cooking to 60° C, and storage (7° C for 24 h), beef loaf (100 g) was microwave-heated: 20, 50, 80 or 110 s. Potatoes were reconstituted, stored (7° C for 24 h), portioned (100 g/portion), and microwave-heated: 25, 45, 65 or 84 s. Beans were thawed (7° C for 24 h), portioned (100 g/portion), and microwave-heated: 20, 50, 80 or 110 s. Aerobic plate counts (APC) for foods were obtained throughout product flow. Wide ranges of ET and of APC in foods indicates that research is needed, for greater control of microwave-heating through advanced microwave engineering and food technology, to produce food with constant microbiological quality. AS

5

Microwave heatable package.
Mitchell, R. P. (American Can Co.)
United States Patent 4 210 674 (1980) [En]

A refrigerated food package is described which is capable of being heated in a microwave oven. It comprises dielectric receptacle means, cover means and a device for venting the package automatically in response to its subjection to microwave energy. IFT

6

Microwave treatment of dehulled rapeseed to inactivate myrosinase and its effect on oil and meal quality.
Maheshwari, P. N.; Stanley, D. W.; Voort, F. R. van de
Journal of the American Oil Chemists' Society 57 (7) 194–199 (1980) [38 ref. En] [Dep. of Food Sci., Univ. of Guelph, Guelph, Ontario, Canada N1G 2W1]

Rapeseed was dehulled using a Palyi pneumatic attrition system which produced 62–66% clean dehulled seed. Dehulled rapeseed was preconditioned to 7, 10 and 13% moisture levels, exposed to microwave irradiation for periods of up to 2.5 min and analysed for residual thioglucoside glucohydrolase (myrosinase) activity. The 7% moisture samples heated slowly and required at least a 2.5 min treatment whereas 10 and 13% moisture samples heated more rapidly and required microwave exposures of 1.5 min or less for complete inactivation of the enzyme. The sulphur content of oils obtained from adequately microwave-treated samples (1.5 min for 10 and 13% and 2.5 min for 7% moisture samples) was equal to or lower than commercially processed crude rapeseed oils. The shorter microwave treatment of dehulled rapeseed produced considerably lighter oils and did not adversely affect the colour of the meal. It also destroyed some of the rapeseed glucosinolates and improved the meal palatability. However, goitrogenic properties of microwave-treated rapeseed meal evaluated by mice feeding experiments did not appear different from untreated rapeseed meal. AS

7

Food item and method of preparation.
Vermilyea, B. L.; Crossen, F. W., Jr.; Mohar, D. D. (International Multifoods Corp.)
United States Patent 4 207 348 (1980) [En]

A dough sheet is covered with a frozen, pre-sized layer of interior filling, which is then totally enveloped to yield a sandwich-like assembly which is proofed under yeast activating conditions and baked. The sandwich-like item has a high tolerance for microwave heating. IFT

8

Dish for holding food to be heated in a microwave cooking chamber.
Husslein, J.; Hertel, W. (Bosch-Siemens Hausgeräte GmbH)
United States Patent 4 210 124 (1980) [En]

Dish for holding foods to be heated in a microwave cooking chamber is described, the dish bowl having high absorption and the handles and/or base having low absorption of high-frequency radiation. In 1 form the dish has 2 dish bowls with a common bottom wall, the inner surface of 1 dish bowl being coated with a high-frequency radiation-absorbing material and the inner surface of the other dish bowl being coated with a high-frequency radiation-reflecting material. AS

9

[Microwave heating in the food industries.] [Review]
Tsuyuki, H.
Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi] 20 (5) 291–298 (1979) [54 ref. Ja] [Food Eng. Dep., Nihon Univ., Shimouma 3-chome, Setagaya-ku, Tokyo, Japan]

Newly established or possible applications of microwave heating, especially for sterilization processes in the food industries, are reviewed. About 1 min microwave treatment of various foods is generally effective for killing yeasts and bacteria, except specific thermoduric bacteria. Applications of microwave heating for defrosting frozen foods, drying potatoes, the expansion-drying process for dough-like food materials and meat cooking processes are also reviewed. TM

10

Energy utilization during microwave cooking.
Collison, R.; Beer, N. J.
Journal of Food Technology 15 (4) 455–457 (1980) [3 ref. En] [Dep. of Catering Studies, Polytechnic, Queensgate, Huddersfield, HD1 3DH, UK]

A number of foods were cooked in a microwave oven having a rated power consumption of 2.4 kW and found to have an efficiency of conversion of electrical energy to microwave energy of 43%. Food loads were 200–300 g and were cooked from 95 to 270 s, depending on food, to reach appropriate internal temp. Microwave energy available in the oven cavity was found to equal the sum of sensible and latent heat for each food; energy used for heating food ranged from 0.35 MJ/kg initial food load (egg custard) to 1.19 MJ/kg (reheating reconstituted potato mix). Other foods tested were cod, sausages, sprouts, cabbage and cauliflower. Electrical energy used for heating foods was 0.82–2.70 MJ/kg. DIH

11

Potato segment and process for preparing frozen French fried potatoes suitable for microwave reheating.
Saunders, F. R.; McLaughlin, R. L. (Amfac Foods Inc.)
United States Patent 4 219 575 (1980) [En]

A process is described for manufacturing frozen French fried potato pieces with a defined shape which are suitable for microwave reheating. IFT

12

Microwave package.
Borek, J. R. (Pillsbury Co.)
United States Patent 4 219 573 (1980) [En]

An improved expandable popcorn container for use in microwave ovens is adapted to store popcorn, oil and salt before popping and to contain the popcorn, oil and salt during exposure to microwave radiation for popcorn popping. IFT

13

Food temperature control in a microwave oven.
Matsubara, S.; Tsuda, T. (Sharp Co. Ltd.)
United States Patent 4 217 477 (1980) [En]

The device described is for use in a microwave oven which may operate in a temp. control mode, where the temp. of a food to be cooked is maintained between 2 selectable values. The food temp. is sensed by a probe adapted for insertion into food being cooked in the microwave oven. The probe is electrically connected to a microwave generation control circuit through a removable plug in a socket secured by a microwave oven wall. When the plug is engaged by the socket, the microwave oven is automatically placed in the temp. control mode. AS

14

Application of microwave and high frequency heating in food processing. (In *'Food process engineering 1979'* [see FSTA (1981) 13 4E167].) [Lecture]
Bengtsson, N.; Ohlsson, T.
Abstr. no. 3.0.3 (1979) [En] [SIK - Swedish Food Inst., Göteborg, Sweden]

Dielectric heating of food by transfer of electromagnetic energy is reviewed. Such heating has the unique property of rapid heat penetration into food, and has become a standard unit operation with a defined theory and suitable process calculation procedures. Dielectric heating includes microwave (900–3000 MHz) or high frequency heating (10–60 MHz). The former has many applications (listed) and interest in the latter is increasing, although the number of industrial units is relatively small. ELC

15

The effects of microwave blanching on the nutritional and textural quality of freeze-dried spinach.
Quenzer, N. M.
Dissertation Abstracts International, B 40 (12) 5599: Order no. 80-11983, 113pp. (1980) [En] [Texas A&M Univ., College Station, Texas 77843, USA]

The following blanching methods were compared: (i) microwave, (ii) steam and (iii) water. (i) caused least vitamin C loss (309.87 mg/100 g dry wt.) in freeze-dried spinach, moderate α-tocopherol loss (2.67 mg/100 g) and higher β-carotene loss (24.86 mg/100 g) than (ii) or (iii), but caused most thermal damage and gave a product which rehydrated poorly. (iii) caused most cell disruption and content leaching and (ii) gave intermediate levels. Because cell structure remained intact during microwave blanching it was the best method for allowing vitamin C and textural quality retention. LH

16

Disposable structure for use in microwave cooking.
Kubiatowicz, J. F.
United States Patent 4 214 515 (1980) [En]

A structure is described for cooking in a microwave oven strips of food that gives off liquid in the cooking process, e.g. bacon. The structure comprises a nonmetallic base portion with a top surface and a cavity recessed from the top surface adapted to contain the liquid released from the strips; and a nonmetallic narrow support surface directly over the cavity over which the strips of food can be hung as they are cooked, so that liquid from the strips drains into the cavity. AS

17

Pretreatment of rice bran with extrusion cooking for oil extraction. (In *'Food process engineering 1979'* [see FSTA (1981) 13 4E167].) [Lecture]
Liu, T.-Y.; Chang, S.-C.; Lee, T.-C.
Abstr. no. 3.2.7 (1979) [En] [Food Ind. Res. & Development Inst., PO Box 246, Hsinchu, Taiwan]

Rice bran, available in large quantities from rice milling, is a valuable potential source of high grade edible oil (10–18%) and protein (10–15%), but oil extraction presents problems due to rapid formation of fatty acids by lipase in freshly milled bran, resulting in large refining losses, inefficient percolation extraction from a very fine bran structure and difficulty of assembling raw material from numerous small capacity mills. Oil extracted from untreated bran could reach 24.2% free fatty acid after storage for 2 wk at ambient temp. Effects were evaluated of (i) hot air, (ii) microwave cooking and (iii) extrusion cooking as pretreatments of bran for lipase inactivation and efficient oil extraction. Free fatty acid contents of extracted oil were from (i) 13.0%, (ii) 11.6% and (iii) 3.6–5.6% after 2 wk storage using cooking at 130°C for 15 s, with no increase of peroxide value. (iii) also induced pellet formation which increased oil extractibility and filtration rate; results for (iii) vs. untreated bran were oil extraction yield 16.2, 11.8%, resp., and filtration rate 28 vs. 15 ml/minute. ELC

18

[Microwave heating for determination of moisture content in poultry meat products.]
Lukacka, J.; Schmidt, S.; Lacinova, D.
Hydinarsky Priemysel 22 (5/6) 202–211 (1980) [25 ref. Sk] [Vyskumny Ustav Hydinarskeho Priemyslu, Bratislava, Czechoslovakia]

Drying in the microwave oven ULTRA X Analysator 1-23C, Gronert A. (Federal Republic of Germany) was used experimentally for detn. of moisture content in liquid and dried egg whites and yolks, and in fresh chicken, hen, and duck meat. The results were in good accordance with those obtained by classical procedures, the time necessary for drying was shortened from about 1 h to 12 min. Curves expressing the course of drying with time are given. STI

19

Portable turntable for microwave oven.
Cunningham, E. M. (Plastics Inc.)
United States Patent 4 216 727 (1980) [En]

A turntable for a microwave oven rotates foods placed on it and effects uniform heating of the foods. The turntable includes a base, a rotatable table for receiving foods and drive means on the base to rotate the table. The base, table, and drive are incorporated in a portable, freestanding removable structure in the microwave oven. AS

20

Food carton for microwave heating.
Wysocki, L. S. (Champion International Corp.)
United States Patent 4 228 945 (1980) [En]

This 2 part severable carton has venting apertures for release of moisture during heating. IFT

21

[Dry matter determination in milk products using the microwave 'Apollo, Mark XII' instrument.]
Trockenmassebestimmung von Milchprodukten unter Verwendung des Mikrowellengerätes 'Apollo, Mark XII'.
Thomasow, J.; Paschke, M.
Deutsche Molkerei-Zeitung **101 (44)** 1661–1665 (1980) [14 ref. De] [Bundesanstalt für Milchforschung, Kiel, Federal Republic of Germany]

The 'Apollo. Mark XII' microwave instrument for moisture or DM determination, manufactured by Photovolt Corporation (New York, USA), is photographically illustrated and described. The instrument operates at 2450 MHz and is fully automated showing in about 6 min digital values for moisture or DM content according to setting. Results of tests with liquid milk, condensed milk, cheese, butter and dried milk are presented and discussed, procedures for each type of product being given. The conclusion was that the instrument generally gives results in good agreement with those of standard methods, but that the spread of values for cheese could be improved by introduction of procedure variants for different cheese types. SKK

22

Water migration and structural transformation of oven cooked meat.
Hung, C.-C.
Dissertation Abstracts International, B 41 (3) 1039: Order no. 80-19535, 238pp. (1980) [En] [Univ. of Minnesota, Minneapolis, Minnesota 55455, USA]

Experiments were conducted to investigate the mechanism of heat and mass transfer in meat during hot air heating; an environmental oven with electrical resistance as heating source was used. 2 theories of water loss were tested: the shrinkage theory, in which water loss is due to muscle fibre shrinkage during heating; and the crust theory in which the surface layer of the heated sample is a heat and mass transfer barrier. Scanning and transmission electron microscopy were used in the extensive study of structural transformation of hot-air-heated meat. By consideration of the above 2 theories and the nature of microwave heating it is suggested that microwave heating, although fast, produces more wt. loss than hot air heating. Preliminary experiments of combined energy heat (CEH) [microwave and hot air], with equipment designed to monitor accurately microwave power at 2450 MHz and 0.2–5 kW, oven temp. 204°C, and 8.5–51 m^3/h air flow rate at 20°C and 1 atm, showed the capability of CEH to give the high speed of microwave heating together with min. wt. loss. The accuracy of the thermocouple temp. recording and uniformity of the microwave field in the oven during heating were checked using glass bead and water mixture, or localized water in a glass container of the same shape and size as the samples to be heated. A simple mathematical model for heat transfer during microwave heating was established. Results of this model may be used qualitatively as a reference to find the parameters needed in conducting further experiments. SP

23

Microwave thawing.
Meredith, R. J. (Magnetronics Ltd.)
UK Patent Application 2 042 855A (1980) [En]

Process in which food, e.g. meat is defrosted by exposure to microwave energy under reduced atm pressure so that the water in the frozen food boils at a temp. at which the food remains uncooked. RAW

24

Microwave cooking method and control means.
Tyler, H. J. (Robertshaw Controls Co.)
United States Patent 4 230 731 (1980) [En]

Method and apparatus are described for controlling microwave cooking. A temp. measuring probe monitors the temp. of a comestible during cooking, which is interrupted at a predetermined time in cooking cycle, and the comestible is permitted to equilibrate to a true temp. Cooking is then resumed in accordance with true temp., e.g. the input power level is selected so that the rate of cooking is reduced when the true temp. is close to the final desired temp., so allowing the comestible to coast to the final temp., and insuring against over-cooking. AS

25

Method and material for prepackaging food to achieve microwave browning.
Brastad, W. A.; Beall, N. J. (General Mills Inc.)
United States Patent 4 230 924 (1980) [En]

The food package includes a flexible wrapping sheet of dielectric material, e.g. polyester or paperboard, capable of conforming to at least a portion of the food article's shape. This sheet has a flexible metallic coating of either a relatively thin film or relatively thick foil of e.g. Al, the coating being subdivided into a number of individual metallic islands or pads. When the package is placed in a microwave oven, some of the microwave energy passes through the wrapping sheet so as to dielectrically heat the food, but a lesser amount of the microwave energy is converted into thermal energy by the metallic coating so as to brown or crispen the

adjacent portion of food. Various degrees of microwave transparency can be incorporated into the metallic coating to give the desired amount of browning. AS

26

[Microwave dielectric heating for spray drying of mandarin orange juice.]
Watanabe, A.; Minamisono, H.; Kimura, S.
Journal of Japanese Society of Food Science and Technology [Nippon Shokuhin Kogyo Gakkaishi] 26 (2) 76–80 (1979) [Ja, en] [Nat. Food Res. Inst., 1-4-12, Shiohama, Koto-ku, Tokyo, Japan]

The application of microwave dielectric heating to spray drying of mandarin orange juice was investigated using a mobile spray drier (Niro Atomizer Co.) connected to a microwave generator with a frequency of 2450 MHz. Drying temp. was found to be critical and in a narrow range, due to powder sticking to the walls at temp. too high or too low. Optimum outlet temp. of hot air was approx. 55°C for mandarin orange juice and 70°C for juice containing 3% added dextrin. Drying rate of mandarin orange juice rapidly decreased at <100% moisture content (dry basis), and microwave absorption efficiency for mandarin orange juice, compared with that for pure water, decreased rapidly at 70–80% moisture content (dry basis). It was concluded that concentrated rapid microwave heating at approx. 100% moisture content should be effective for increased yield of dried powder. [From En summ.] SP

27

[Microwave processing of foods.]
Staron, T.; Perrin, L.; Thirouin, D.; Frere, G.
Medecine et Nutrition 16 (5) 355–366 (1980) [Fr, en] [Sta. des Antibiotiques & des Bioconversions, INRA, 28110 Luce, France]

Uses of microwaves in food processing are discussed. Aspects considered include: characteristics of microwave radiation; advantages of microwave heating; microwave drying; microwave cooking; effects of prior microwave heating on extraction of oils, sugar juices or leaf protein; disinfestation and sterilization by microwave heating; detoxification (e.g. reduction of aflatoxin concn.) by microwave heating; microwave thermolysis of microorganisms; microwave heating in rice polishing; microwave heating to inactivate pectolytic enzymes impairing turbidity of citrus juices; applications of microwave heating in homogenization and emulsification processes; effects of microwave heating on nutritional value; and costs of microwave heating. AJDW

28

[Dielectric heating of foods. II. Recent applications in industrial processing.] Das dielektrische Erwärmen von Lebensmitteln. II. Neuere Anwendungen in der industriellen Verarbeitung.
Reuter, H.
Zeitschrift für Lebensmittel-Technologie und -Verfahrenstechnik 31 (1) 7–12 (1980) [10 ref. De] [Inst. für Verfahrenstech., Bundesanstalt für Milchforschung, 2300 Kiel, Federal Republic of Germany]

Applications of microwave heating in industrial processing of foods are discussed, with reference to: continuous and batch-type microwave-heating equipment; problems with the unsuitability of metal containers for products to be microwave heated; industrial applications of microwave heating (including reheating, cooking, blanching, drying); thawing of frozen raw materials (fish, meat, fruit, vegetables) for further processing; methods and equipment for pasteurization or sterilization of dairy products (milk, yoghurt, fresh cheese), juices, beverages, jam, sliced breads etc. by microwave heating; and economics of microwave processing techniques. [See Zeitschrift für Lebensmittel-Technologie und -Verfahrenstechnik (1979) 30 (6) 242 for part I.] AJDW

29

Acceptability of microwave and conventionally baked potatoes.
Brittin, H. C.; Trevino, J. E.
Journal of Food Science 45 (5) 1425–1427 (1980) [28 ref. En] [Dep. of Food & Nutr., Texas Tech. Univ., Lubbock, Texas 79409, USA]

A survey of 200 consumers who purchased fresh potatoes in supermarkets showed that 16% owned microwave ovens and most of these owners usually bake fresh potatoes in microwave ovens. Microwave and conventionally baked Norgold Russet and Viking potatoes grown in West Texas were evaluated by a 10-member trained sensory panel and by 120 consumers in a supermarket. Microwave baked potatoes had significantly greater % cooking loss, less cooking time, and lower sensory scores by the trained panel than conventionally baked potatoes. However, the consumers indicated no significant difference in the preference or acceptability of microwave and conventionally baked potatoes. Sp. gr. was not significantly related to texture or overall acceptability. IFT

30

Effect of microwave blanching on the color and composition of strawberry concentrate.
Wrolstad, R. E.; Lee, D. D.; Poei, M. S.
Journal of Food Science 45 (6) 1573–1577 (1980) [25 ref. En] [Dep. of Food Sci. & Tech., Oregon State Univ., Corvallis, Oregon 97331, USA]

Influence of native enzymes on colour and composition of strawberry juice and concentrate was investigated through analyses of juice and concentrate made from microwave-blanched and from unheated fruit. Changes in anthocyanin (ACN) pigment, leucoanthocyanins, flavanols, total phenolics, ascorbic acid, and dehydroascorbic acid were monitored during 8 wk storage at 20°C; Hunter colour parameters, polymeric colour, and browning were also measured. Blanching resulted in improved colour stability and had a protective effect on ACN pigments, reactive phenolics, and ascorbic acid. Blanched strawberry concentrate browned slower than the control. Monomeric ACN pigment underwent rapid degradation to form polymeric pigments which were resistant to bisulphite bleaching. IFT

31

Starch hydrolysis by acid and microwave energy.
Khan, A. R.; Robinson, R. J.; Johnson, J. A.
Journal of Food Science 45 (5) 1449, 1451 (1980) [12 ref. En] [Dep. of Grain Sci., Kansas State Univ., Manhattan, Kansas 66506, USA]

Wheat starch was hydrolysed using microwave energy. Starch suspensions (10%) acidified with HCl to pH 1.85 were heated at 0.18 mA microwave energy in sealed glass tubes for various times. Liquefying and colouring were the most obvious visible changes during hydrolysis. With extended heating times, temp., pressure, and total acidity increased causing darker hydrolysates and charred residue formation. Paper chromatography showed sugars with 1–5 monomers per chain. Starch hydrolysates had total sugars, reducing sugars, and glucose as high as 94.81, 88.69, and 83.56%, resp., based on original starch. Sugar syrups of high DE can be produced within a short time by using microwave energy. IFT

32

Effects of microwave cooking on food fatty acids: no evidence of chemical alteration or isomerization.
Mai, J.; Tsai, C. H.; Armbruster, G.; Chu, P.; Kinsella, J. E.
Journal of Food Science 45 (6) 1753–1755 (1980) [12 ref. En] [Inst. of Food Sci., Cornell Univ., Ithaca, New York 14953, USA]

Because of the current interest in the potential physiological effects of *trans* fatty acids and a brief report that microwave cooking causes isomerization of unsaturated fatty acids, a study was made of effects of microwave treatments on the fatty acid composition of several food lipids, i. e., chicken fat, beef tallow, bacon fat, rainbow trout, peanut oil, and potato lipids. The data indicate that microwave cooking *per se* does not change the fatty acid pattern of these lipids or cause isomerization of the unsaturated fatty acids. IFT

33

Influence of microwave reheating on selected quality factors of roast beef.
Johnston, M. B.; Baldwin, R. E.
Journal of Food Science 45 (6) 1460–1462 (1980) [20 ref. En] [Dep. of Food Sci. & Nutr., Univ. of Missouri, Columbia, Missouri 65211, USA]

Roast beef slices (*longissimus* muscle), when reheated by microwaves after 2 days storage (4°C), compared favourably with conventionally reheated samples. Sensory evaluation indicated significantly less intense "warmed-over" aroma in microwave reheated than in conventionally reheated samples. No differences in "warmed-ove r" flavour of the slices or in lipid oxidation (TBA numbers) were evident in the meat reheated by the 2 methods. No significant losses of thiamin or riboflavin resulted from either microwave or conventional reheating. IFT

34

The role of creatine and creatinine in the flavor intensity of microwave and conventionally cooked beef.
Snider, S.
Dissertation Abstracts International, B 41 (5) 1705 Order no. 80-24397, 246pp. (1980) [En] [Univ. of Missouri, Columbia, Missouri 65201, USA]

The relation of creatine or creatinine concn. to the flavour intensity of beef cooked by microwave or conventional methods was evaluated; the performance of trained and untrained panels was also investigated. Flavour intensity of beef cooked in an institutional-type microwave oven was rated higher than that of conventionally-cooked beef; however, flavour intensity of beef cooked in a domestic microwave oven was rated lower than that of conventionally-cooked beef. No relationship between sensory threshold for creatine and ability to detect differences in flavour intensity between microwave- and conventionally-cooked beef was observed. Trained panelists performed better than untrained panelists. Creatinine content was greater in microwave-cooked than in conventionally-cooked beef; correlations between creatinine content and flavour intensity were significant only in some trials. Microwave-cooked samples tended to have higher cooking losses and lower moisture contents than conventionally-cooked samples. AJDW

35

Microwaves for catering.
Giles, P.
Frozen Foods 33 (5) 32 (1980) [En]

Advantages of microwave ovens for catering purposes, features of a typical microwave cooker suitable for catering, and the use of microwave ovens for defrosting frozen food are discussed. AL

36

Portable turntable for microwave oven.
Cunningham, E. M. (Plastics Inc.)
United States Patent 4 239 009 (1980) [En]

A turntable in a microwave oven rotates foodstuffs placed on it and effects uniform heating of the foods. The turntable includes a base, a rotatable table for receiving foods and drive means on the base for rotating the table; the base, table, and drive means are incorporated in a portable, freestanding structure which can be placed in and removed from the microwave oven. AS

37

Effective time ratio browning in a microwave oven employing high thermal mass browning unit.
Hurko, B.; Payne, T. R. (General Electric Co.)
United States Patent 4 242 554 (1980) [En]

A time ratio control system for a microwave oven includes a food surface browning system of relatively high thermal mass which is operated from a limited power source. To ensure effective browning, each effective browning interval has at least a predetermined min. duration to allow the browning system time to reach at least a min. effective temp. AS

38

Stability of proteinase inhibitors in potato tubers during cooking.

Huang, D. Y.; Swanson, B. G.; Ryan, C. A.

Journal of Food Science 46 (1) 287–290 (1981) [13 ref. En] [Dep. of Agric. Chem., Washington State Univ., Pullman, Washington 99164, USA]

3 proteinase inhibitors, Inhibitor I (a chymotrypsin inhibitor), Inhibitor II (a chymotrypsin and trypsin inhibitor), and Carboxypeptidase Inhibitor (CPI), were quantified immunologically in extracts of various tissues of Russet Burbank potato tubers and were monitored over various intervals during boiling (30 min), oven baking (80 min, 191°C) and microwave baking (7 min) to assess the effectiveness of cooking in denaturing the potentially toxic proteins. In cooked tubers, Inhibitor II was completely inactivated during all cooking treatments and Inhibitor I was partially inactivated, the extent depending upon the cooking method. CPI was extraordinarily stable during all of the cooking conditions. Overall, microwave baking was most effective for cumulatively inactivating Inhibitor I and Inhibitor II. The unusual stability of CPI to all types of cooking raises questions concerning the effect of this inhibitor on the total digestibility of cooked potato proteins. IFT

39

Effect of microwave and conventional cooking on the nutritive value of Colossus peas *(Vigna uniguiculata).*

Chung, S. Y.; Morr, C. V.; Jen, J. J.

Journal of Food Science 46 (1) 272–273 (1981) [12 ref. En] [Dep. of Food Sci., Clemson Univ., Clemson, S. Carolina 29631, USA]

Effect of microwave and conventional cooking methods, designed to simulate those used in home meal preparation, on nutrient retention in Colossus peas was studied. Neither method resulted in significant changes in the fat, protein, β-carotene and ascorbic acid content of the peas. Microwave cooking resulted in slightly greater losses of several amino acids, but resulted in significantly greater retention of thiamin and riboflavin than the conventional treatment. Although each of the mineral components exhibited different magnitudes of loss by the 2 cooking methods, differences due to method of cooking were not significant. Both Fe and Cu were completely retained in the peas cooked by both methods. Both cooking methods (15–60 min cooking) resulted in 92–97% loss of trypsin inhibitor. IFT

40

Comparison of microbiological and radiometric assays for determining total folacin in spinach.

Klein, B. P.; Kuo, C. H. Y.

Journal of Food Science 46 (2) 552–554 (1981) [19 ref. En] [Dep. of Foods & Nutr., 274 Bevier Hall, Univ. of Illinois, Urbana, Illinois 61801, USA]

Several commercially available forms of spinach were analysed for total folacin content by microbiological assay using *Lactobacillus casei* [see Scott et al. (1974) *American Journal of Medical Technology* 40 (3) 125] and a radiometric assay [see Longo & Herbert (1976) *Journal of Laboratory and Clinical Medicine* 87, 138]. Types of products included frozen uncooked, fresh raw, microwave and conventionally cooked fresh and creamed strained spinach. Folacin content ranged from 0.62 μg/g for strained spinach to 2.50 μg/g for uncooked frozen spinach, when assayed microbiologically. With the radiometric assay, folacin values were significantly higher ($P < 0.05$) than with the *L. casei* assay. The microbiological assay appears more suitable for detn. of total folates in complex food matrices than the radioassay. IFT

41

Effects of microwave, steam and water blanching on freeze-dried spinach.

Quenzer, N. M.; Burns, E. E.

Journal of Food Science 46 (2) 410–413, 418 (1981) [14 ref. En] [Dep. of Hort. Sci., Texas A&M Univ., College Station, Texas 77843, USA]

Microwave energy was demonstrated to be a convenient and effective method of blanching. Compared to steam or water, microwave blanching was superior in retention of ascorbic acid. The texture of rehydrated, microwave blanched spinach was firm, chewy and highly acceptable. Water blanching ruptured the cells and destroyed fine cellular structure; steam blanching caused less cellular disruption and greater retention of tissue structure. Microwave blanching resulted in formation of coagulated protoplasmic material round the cell walls. Cell and tissue structure remained intact, which resulted in high rehydration ratios and acceptable textural characteristics. Microwave blanching yielded a better freeze-dried product than water and steam blanching. IFT

42

Folacin and ascorbic acid retention in fresh raw, microwave and conventionally cooked spinach.

Klein, B. P.; Kuo, C. H. Y.; Boyd, G.

Journal of Food Science 46 (2) 640–641 (1981) [17 ref. En] [Dep. of Foods & Nutr., 274 Bevier Hall, Univ. of Illinois, Urbana, Illinois 61801, USA]

Fresh spinach was assayed for total folacin and reduced ascorbic acid content, before and after cooking by a microwave and conventional method. Mean ascorbic acid content of raw, microwave cooked and conventionally cooked spinach was 26.5, 13.5 and 17.0 mg/100 g, resp. Ascorbic acid content was decreased significantly by both cooking methods; retention was 47% in microwave and 51% in conventionally cooked spinach. Total folacin content of raw, microwave, and conventionally cooked spinach was 161, 183, and 157 μg/100 g, resp. Retention of folate was 77% in conventionally cooked and complete in microwave cooked spinach. IFT

43

[Physical measures with hot air or high frequencies against insects of grains and cereal products.]

Fleurat-Lessard, F.

Bulletin Technique d'Information No. 349, 345–352 (1980) [2 ref. Fr] [INRA, Lab. de recherches sur les insectes et les acariens des denrees stockees, 33140 Pont-de-la-Maye, France]

Methods for destruction of insect pests in cereals and cereal products where fumigation or application of contact insecticides is not appropriate include mechanical crushing, hot or cold ventilation, sealed or inert atmosphere storage, and irradiation. Theoretically, a rapid high temp. treatment with immediate recooling to normal storage temp. is a hygienic and certain method of disinfestation. This can be achieved using fluidized bed or pneumatic transport methods with hot air, or by high frequency radio emissions (micro-waves). Results of laboratory tests of these 2 techniques are presented. The hot air method used pulsed air at up to 180°C to destroy larval forms of *Sitophilus oryzae* in wheat and semolina, with small water losses and no effects on quality. With microwaves, exposures of approx. 1 min to radiation of 800 W heated grain to 60–65°C and destroyed insects within the grains of a 500 g wheat sample; semolina samples required longer times. Advantages of microwaves are the rapid rise in temp. and the selective deposition of heat. Breadmaking tests on flour from treated wheat were satisfactory. [See FSTA (1981) 13 9M884.] JRR

44

[Oven for rapid baking of bread; the bread by dielectric loss and the crust by infra-red rays.]

Remy, R. (**France**, Electricite de France)

French Patent Application 2 443 205 (1980) [Fr]

Bakers' oven comprises a conveyor belt with upper and lower surfaces. Bread is baked in a decimetric microwave chamber; the crust is baked by IR rays from iron bands beneath the upper and lower belt surfaces, the bands extending along the whole width of the oven longitudinally crossed by electric current to give them a temp. of 350–500°C. W&Co

45

[Microwave heating from the viewpoint of retention of some heat-labile vitamins.]

Uherova, R.; Smirnov, V.; Simanova, V.

Prumysl Potravin 31 (11) 612–613 (1980) [4 ref. Sk] [Slovenska Vysoka Skola Tech., Chemickotech. Fak., Bratislava, Czechoslovakia]

Samples of minced pork (from leg) obtained from a meat factory near Bratislava (Slovakia) were examined either raw, or after microwave treatment (in a GUM 2S microwave oven manufactured in 1965 in the Prague-Zabehlice electric cooker factory) for 1–2 min at 0.5–0.6 A to an internal temp. of about 90°C, or after roasting (in a Tatramat electric oven) for 30 min at 1800 W, an environmental temp. of about 180°C and internal temp. of about 90°C. The experiments were carried out 3 × in March and 2 × in Nov. 1979. The samples were homogenized in a Finis homogenizer, and thiamin and vitamin B_6 contents were determined by the Czechoslovak Standard thiochrome and microbiological methods, resp. The % retention values of thiamin and vitamin B_6 are graphically presented for each of the 5 tests. Overall retentions for the microwave treatment were 95% for thiamin, and 83% for vitamin B_6; corresponding retentions for oven roasting were 66 and 49%, resp. SKK

46

Microwave tunnel oven for the continuous processing of food products.

Meisel, N.

United States Patent 4 246 462 (1981) [En]

47

[Microwave treatment of biological food products.]

Staron, T.; Thiromin, D.; Perrin, L.; Frere, G.

Industries Alimentaires et Agricoles 97 (12) 1305–1312 (1980) [Fr] [INRA, Luce, France]

This review includes section on the classification of microwaves, principles of microwave treatment, advantages, applications, apparatus, products treated, treatment times, cooking by microwaves, drying by microwaves, extraction of microwave-treated products, microwave control of insect and microbial contamination, detoxication, microwave cell destruction (for single-cell protein, SCP) application to homogenization, stabilization of citrus juices, and processing of rice. Tabulated data illustrate the effect of treatment on nutritive value of foods (results of animal feeding experiments), composition of foods, moisture loss, efficiency of extraction of vegetable juice, sugarbeet juice and vegetable oil, survival of insects and microbial spores, aflatoxin content of groundnut cake, and lysis of microorganisms (SCP). RM

48

Beef preparation expectations as defined by microwave user survey – a marketing opportunity.

Gast, B.; Seperich, G. J.; Lytle, R.

Food Technology 34 (10) 41–43 (1980) [11 ref. En] [Div. of Agric., Arizona State Univ., Tempe, Arizona 85281, USA]

A survey was conducted in the Phoenix Metropolitan area (Arizona, USA) of microwave oven ownership and usage patterns, particular consideration being given to the level of satisfaction with the ovens and to the utilization of microwave ovens for cooking beef. The survey, involving completion of a questionnaire, resulted in replies from 400 owners of microwave ovens. Results indicated that microwave ovens are predominantly used for warming up/defrosting foods, that vegetables are the food item most commonly cooked in such ovens and that the acquisition of a microwave oven does not influence the types of food purchased. Responses to questions relating to the microwave cooking of fish and meat indicated that ground beef is most popular and fish the least popular. The level of satisfaction with the ovens was directly related to the amount of instruction given on their use, this trend being most apparent with beef; owners who had received ≥ 1 day of organized instruction were consistently more satisfied with the cooking results. JA

49

[Thawing of frozen meat in microwave units.]
Oterbajn, O.
Tehnologija Mesa 21 (1) 17–18 (1980) [Sh, en] [IMK 29. Novembra, Subotica, Yugoslavia]

2 limitations exist when using frozen meat for meat products, viz. (i) thawing takes twice as long as freezing, and (ii) uniform thawing is not easily attained. There is as much as 10°C difference between the inside and the outside of meat blocks, and a considerable amount of juice is lost. On thawing, the temp. of all meat portions changes from between −18 and −22°C to between −4.4 and −3.3°C. Microwave thawing is advantageous, being fast and penetrating; this leads to only a few min. thawing, with no juice lost. The 'Raytherm' microwave tunnel has a capacity of 1000–3000 kg of meat in blocks 25–30 kg each. Thawing takes 5 min and is continuous. The advantages are: continuous action; exact attainment of the desired temp. throughout the whole block; limited floor space; easy sanitation and removal of cardboard residues from the meat; no bacterial contamination on thawing; and better quality due to retention of juice. STI

50

Microwave-cooking browning composition.
Moody, R. D.
United States Patent 4 252 832 (1981) [En]

Aqueous syrup is described for effecting browning of foods cooked in microwave ovens, comprising a melted, caramelized, and foamed disaccharide, alone or in combination with a minor amount of a monosaccharide, subsequently dissolved in water to form the syrup. Microwave-cooked foods, e.g., meats, poultry, fish, eggs and pastries, such as cakes and pies, which usually have white or grey appearance, have the browned appearance of conventionally cooked foods when treated by basting or when the recipe includes the syrup browning agent. AS

51

Microwave meal rack.
Hansen, L. J.
United States Patent 4 249 464 (1981) [En]

A meal rack is so constructed to double the usable oven space in a microwave oven. AS

52

[Microwave heating of foods. Summaries of papers presented at a symposium held at SIK, 7–8 November 1979.] [Conference proceedings]
Sweden, SIK-Svenska Livsmedelsinstitutet
SIK Rapport No. 459, 47pp. (1979) [Sv] [Fack, S-400 23 Göteborg, Sweden]

Summaries are given of the following papers presented at this symposium: Basic principles of microwave heating, by T. Ohlsson (pp. 10–11, Sv). Equipment for microwave heating, by B. Berggren (pp. 12–13, Sv). Control of microwave leakage, by B. Berggren (p. 14, Sv). Safety requirements for microwave equipment, by P. O. Risman (pp. 15–17, Sv). A review of applications of microwaves in the food industry, by N. Bengtsson (pp. 18–20, Sv). Some practical examples of industrial microwave installations, by L. Jonsteg (pp. 21–22). Applications of microwave heating of foods, by T. Ohlsson (pp. 23–24, Sv). A survey of the domestic microwave oven market in the USA, by J. V. Rauseo (p. 25, En). The wide range of applications of microwave ovens, by B. Kidblad & J. Carmblad (pp. 26–28, Sv). The response of the US food industry to the microwave oven challenge, by J. V. Rauseo (p. 29, En). Microwave ovens in catering facilities – a critical review of 15 years development, by P. O. Risman (pp. 30–31, Sv). The AFS-system for automated serving of hot meals, by G. Rejler (pp. 32–35, Sv). Experience with a microwave oven-based catering system, by L. Östgren (pp. 36–41, Sv). Alternative packaging methods, by T. Ohlsson (pp. 42–43, Sv). A list of SIK publications and reports on microwave heating of foods is included. AJDW

53

Microwave package.
Seiferth, O. E.
UK Patent Application 2 046 060A (1980) [En]

Food tray or package for microwave ovens has embedded metal foil for heating and browning. IFT

54

Food carton for microwave heating.
Faller, R. A. (Champion International Corp.)
United States Patent 4 260 060 (1981) [En]

A carton is described which is especially adapted for heating food products, e.g. pizza, in microwave ovens. The bottom surface of the carton is cut to give a number of tabs, which when bent from the carton, provide legs to space the bottom of the carton from a shelf in the oven, thus allowing moisture vapour generated during heating to escape. In a preferred embodiment, a releasable moisture barrier film is adhered to the bottom surface of the carton and a number of tabs so that, upon removal of the film prior to heating, the tabs are bent into their operable support position and the vent holes are opened. AS

55

Detection of methanol in wine by microwave spectroscopy.
Kitchin, R. W.; Willis, R. E.; Cook, R. L.
Analytical Chemistry 53 (8) 1190–1192 (1981) [5 ref. En] [Dep. of Physics, Mississippi State Univ., Mississippi State, Mississippi 39762, USA]

Microwave rotational spectroscopy in the frequency range 26.5–40 GHz was used to detect methanol at various concn. The presence of moderate amounts in a water and ethanol solution was quickly revealed by a low-resolution scan. The detection of amounts on the order of 100 p.p.m. required the high-resolution identification of particular lines. A quantitative estimate of the concn. of methanol in 5 different wines was performed by comparing the area of a particular line to that of a standard methanol sample obtained under

identical experimental conditions. In this limited study, the amount of methanol in the 5 wines tested did not seem to be correlated with cost or colour. However, fortified wines seemed to have less methanol than unfortified inexpensive wines. AL

56

Effect of heating rate and freezing and reheating of corn and wheat starch-water dispersions.

Holmes, Z. A.; Soeldner, A.

Journal of the American Dietetic Association 78 (4) 352–355 (1981) [16 ref. En] [Dep. of Foods & Nutr., Oregon State Univ., Corvallis, Oregon 97331, USA]

A 5% corn or wheat starch-water dispersion was used for the following tests: heating on an oil bath until the temp. of the dispersion reached 85°C; frozen, stored and reheated in either a waterbath or a microwave oven. Evaluation of the scanning electron micrographs showed that a heated starch-water dispersion is sensitive not only because of the type of starch but also to the mode of heating, cooling and reheating. Heating the corn and wheat starch-water dispersions at differen rates gave differences in granule appearance. Starch-water dispersions were influenced by both freezing and reheating. Microwave oven reheating appeared to yield a product with more retrogradation of the starch component. VJG

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FAB 5

MICROWAVES IN FOOD PROCESSING

SELECTED FROM VOLUME 14
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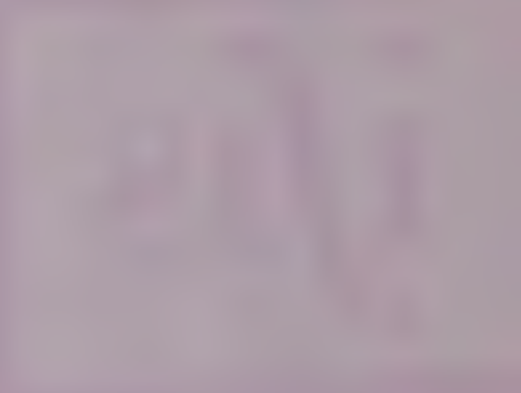
under the direction of:-

Commonwealth Agricultural Bureaux, Farnham Royal, Slough; Gesellschaft fur Information und Dokumentation, Frankfurt am Main; Institute of Food Technologists, Chicago; Centrum voor Landbouwpublikaties en Landbouwdocumentatie (Pudoc), Wageningen.



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H. BROOKES

EDITOR

1

[Pasteurization of ready-to-serve foods. I. Effect of some treatments on the microbial contamination of beef goulash and mathematical simulation of the process.]

Valles, S.; Pinaga, F.; Carbonell, J. V.

Revista de Agroquimica y Tecnologia de Alimentos 19 (2) 229–242 (1979) [14 ref. Es, en] [Inst. de Agroquimica & Tecnologia de Alimentos, Valencia, Spain]

300 g portions of beef goulash were inoculated with 100 000 germs/g of *Bacillus cereus, Clostridium pasteurianum* or *C. butyricum* and packed in polypropylene bags at >85°C, or by mixing cold solid ingredients (3°C) with hot sauce (95°C). Sealed bags were pasteurized by steam at atmospheric pressure for 3, 10 or 15 min (hot-filled packages), 5, 30 or 40 min (mixed cold solids and hot sauce), and cooled by air at 3°C, 5 m/s or by immersion in water at 16°C (to core temp. 30°C), then at 1–3°C. The effects of holding hot-filled packages at room temp. to core temp. of 85°C and of pasteurizing cold-filled packages by microwave treatment were also studied. Results, shown graphically, revealed that 3 or 10 min steam treatment of hot-filled packages achieved very efficient reduction of contamination (to about 1000/g); cooling method had no great effect. If hot and cold components were mixed, 30 min steam treatment were needed to achieve corresponding pasteurization. Holding the hot product at room temp. and intermittent microwave treatment only reduced bacterial counts to 28 800 and 38 000/g resp. and were not useful for pasteurization. In order to quantify the effects of heat treatment on bacteriological quality, a mathematical model was developed which allows the process to be simulated by computer. RM

2

Effect of microwave heating in cook/chill foodservice systems.

Dahl, C. A.; Matthews, M. E.

Journal of the American Dietetic Association 77 (3) 289–295 (1980) [13 ref. En] [Dep. of Food Sci., Coll. of Agric. & Life Sci., Univ. of Wisconsin, Madison, Wisconsin 53706, USA]

Investigations were carried out to determine the end temp., yield, drip loss, evaporative loss, moisture and fat content of precooked, portioned foods ((i) beef loaf, (ii) mashed potatoes, (iii) frozen beans and (iv) canned green beans) after microwave heating, using a laboratory simulation of a hospital cook/chill food service system with a microwave oven. Beef loaf was initially cooked to a mean internal end temp. of 65°C, dehydrated potatoes were reconstituted and heated to an end temp. of 79°C. Beans were not initially cooked. Products were stored in bulk for 24 h at 6 ± 1°C portioned into 100 g portions, stored for 2 h at 6 ± 1°C and microwave heated: (i) and (iii) for 20, 50, 80 or 100 s; (ii) for 25, 45, 65 and 85 s; and (iv) for 20, 40, 60 or 80 s. Results are tabulated. A wide range (up to 46°C) in mean internal end temp. portioned food after microwave heating was observed after each treatment. This raises questions about the constancy of the microbiological quality of food served to patients in hospitals using microwave ovens. Differences in the rate of microwave heating among the foods in the study raise questions about current practices of heating [illegible] on a single plate. VJG

3

Food composition and method for preparing cheese-coated, puffed snacks upon microwave heating.

VanHulle, G. J.; Anker, C. A.; Franssell, D. E. (General Mills Inc.)

United States Patent 4 251 551 (1981) [En]

In a typical example, a cheese-coated snack food composition, which puffs up on heating in a domestic microwave oven, is composed of a 'puffable' dough containing 51.0% (by wt.) maize meal; 33.3% pregelatinized, waxy maize starch; 3.5% salt; 0.2% colour and 12.0% moisture, and a puffing medium containing 47.0% dehydrated cheese solids; 39.0% coconut oil; 12.5% salt and 1.5% monosodium glutamate. EJM

4

A rapid method for the determination of yeast dry weight concentration.

Rice, J. F.; Sullivan, T. R.; Helbert, J. R.

Journal of the American Society of Brewing Chemists 38 (4) 142–145 (1980) [12 ref. En] [Miller Brewing Co., Milwaukee, Wisconsin 53201, USA]

A rapid method using membrane filtration and microwave drying was developed for measuring yeast dry wt. concn. It permits the detn. of yeast dry wt. in about 0.5 h and has the same precision as a conventional method utilizing centrifugation and hot air drying. The microwave method gives dry wt. measurements about 5% greater than those obtained by the conventional method. Correlation between the methods is good over the concn. range normally found in beer fermentations. The following variables in methodology do not affect precision: microwave time >5 min, sample location in microwave oven, use of plastics (vs. glass) weighing vessels, and sample size within a fixed dry wt. range. Use of a mechanical pipette reduces precision. AS

5

Biological properties of VHF- and microwave-heated soybeans.

Pour-El, A.; Nelson, S. O.; Peck, E. E.; Tjhio, B.; Stetson, L. E.

Journal of Food Science 46 (3) 880–885, 895 (1981) [36 ref. En] [PEACO, PO Box 80130, St. Paul, Minnesota 55108, USA]

Whole soybeans at natural moisture levels (7.6%) were heated by varied exposures to dielectric heating at frequencies of 42 and 2450 MHz. The min. energy absorbed (MEA) was calculated from temp.-elevation and moisture-loss data. Because the heating rates were different at the 2 frequencies, plots of various biochemical properties against temp. or exposure time revealed an apparent frequency dependence. This dependence on frequency disappeared, however, when the MEA value was substituted as the independent variable. Chemical and biochemical analyses revealed that dielectric heating at natural moisture levels should be as efficient as commonly practiced moist "toasting" in improving the nutritional value of soybeans. Trypsin inhibitor activity was reduced to a low level, indicating that max. nutritional quality had been reached. Protein solubility and dispersibility, but not urease activity, can be used as indicators of trypsin inhibitor inactivation by dielectric heating. Indications were obtained the MEA values, or perhaps even moisture loss, might be used as

an index of trypsin inhibitor inactivation. Lipoxygenase-inactivated samples of improved flavour were produced by the dielectric heating treatments. Some treated samples with low trypsin inhibitor and lipoxygenase activities still retained relatively high peroxidase activities that may be advantageous for bleaching effects. IFT

6

[Method and production of inflated porous biological products.] Verfahren und Herstellung poröser aufgeblähter biologischer Produkte.
Wieneke, F.
German Federal Republic Patent Application 2 921 936 (1980) [De]

The products, e.g. potatoes, are softened and swelled by microwaves comprising a precooking stage. The products are in sliced form, and during cooking spices or flavour compounds can be incorporated into the product. W&Co

7

[Microwave heating system for the rapid determination of total solids in milk.]
Iwaida, M.; Yodoshi, M.; Shiroishi, K.
Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi] 21 (2) 150–153 (1980) [4 ref. Ja] [Nat. Inst. Hygienic Sci., Osaka Branch, Hoenzaka, Higashi-ku, Osaka, Japan]

For detn. of TS in milk, the TMS microwave heating system K375A was used. The method took <2% of the time of the conventional official method. Reproducibility was better than with the official method; for 25 replicate detn. the coeff. of variation was 0.13 vs. 0.22% for raw milk, 0.21 vs. 0.31% for market milk, 0.59 vs. 0.73% for reconstituted modified milk and 1.22 vs. 1.55% for coffee milk. TM

8

Cooking at variable microwave power levels.
Drew, F.; Rhee, K. S.; Carpenter, Z. L.
Journal of the American Dietetic Association 77 (4) 455–459 (1980) [25 ref. En] [Consumer Res. Cent., Texas Agric. Exp. Sta., Texas A&M Univ., College Station, Texas 77843, USA]

Comparisons were made of the effects of cooking top round beef roasts from the frozen and thawed states, in a countertop microwave oven at cooking powers of (i) high (553 W) and (ii) simmer (237 W), and (iii) in the upper oven of an electric double oven cooker at a temp. of 325°F (163°C), on the energy consumption, cooking times, cooking losses and palatability. Cooking by (ii) rather than (i) almost doubled cooking time for thawed roasts, but did not increase the time significantly for roasts cooked from the frozen state. Cooking the roasts in the microwave oven required significantly less than cooking by (iii). Energy consumed to cook roasts by (i) or (ii) was not significantly different when the meat was cooked from either the thawed or frozen state. Cooking roasts from the frozen state required 40% more fuel by either (i) or (ii), and about 30% more with (iii). Total cooking losses ranged from 35–40%, the highest % being lost with (i) and the lowest with (iii). Taste panel evaluations showed no significant differences in palatability of thawed roasts cooked by (i), (ii) or (iii). When cooking started from the frozen state, roasts cooked by (ii) were comparable to (iii) in sensory quality. Roasts cooked from the frozen state by (i) had significantly lower palatability scores (except flavour scores) and higher shear values than did roasts cooked by (ii) and (iii). VJG

9

[Measurement of temperature and temperature distribution in a microwave field.] Messung der Temperatur und der Temperaturverteilung im Mikrowellenfeld.
Grünewald, T.; Rudolf, M.
Zeitschrift für Lebensmittel-Technologie und -Verfahrenstechnik 32 (3) 85–88 (1981) [12 ref. De] [Inst. für Verfahrenstech., Bundesforschungsanstalt für Ernährung, Engesserstrasse 20, 7500 Karlsruhe 1, Federal Republic of Germany]

Aspects discussed include: basic principles of microwave heating of foods; use of thermocouples, and problems with this technique; published methods for measurement of temp. distribution; and use of liquid crystals for detn. of temp. distribution. AJDW

10

Electric heating elements.
Markum, T. R. (Emerson Electric Co.)
United States Patent 4 264 804 (1981) [En]

Support legs are described for bake elements used in microwave ovens of the dual-purpose cavity oven type. The improved support leg comprises a threaded stud welded to the sheath of a conventional electric heating element, a threaded portion projecting from the sheath to receive an internally threaded ceramic sleeve. Ceramic cement is preferably used to prevent disassembly of the sleeve from the stud. The support leg can also be a support standoff since the ceramic sleeve provides electrical clearance between the metal stud and the oven liner bottom to isolate and prevent any metal-to-metal contact. AS

11

Microwave heating device and method.
Anderson, G. R.; Ott, W. R.; Smoke, E. J.; Easter, R. A.; Sholl, J. J. (Pillsbury Co.)
United States Patent 4 266 108 (1981) [En]

A microwave heating device for cooking food consists of a microwave reflector with magnetic microwave absorbing material positioned adjacent to it. The absorbing material heats by coupling the magnetic component of microwave radiation. The thickness of the absorbing material is such that at the Curie temp. the material will reflect ≥65% of the incident microwave radiation. The absorbing material has a vol. resistivity value R, at room temp., in ohm cm of greater than approx. the value where $\log R = (Tc/100)+2$ where Tc is the Curie temp. (°C) of the material. By the proper combination of thickness, high resistivity and Curie temp., the device is temp. self-limiting in a microwave field and can be used to heat objects in contact with the device to predetermined temp. in spite of wide fluctuations in microwave power or power uniformity. AS

12

Packaged food item and method for achieving microwave browning thereof.
Brastad, W. A. (General Mills Inc.)
United States Patent 4 267 420 (1981) [En]

A food item is wrapped with plastics film or other dielectric substrate having a very thin coating which controls the microwave conductivity when the package is placed within a conventional microwave oven. The plastics film or other substrate and its coatings conform to a large surface portion of the food item. The coated plastics film or other substrate converts some of the microwave energy into heat which is transmitted directly to the surface portion so that a browning and/or crispening is achieved. The coating may also modify the microwave field configuration so as to further enhance the heating of the food surface immediately adjacent to the film in which the food is packaged. The microwave energy not converted into heat by the coated film passes through the film to dielectrically heat the single food item as is normally done with microwave cooking. AS

13

Microwave energy moderator.
Flautt, T. J., Jr.; Maguire, E. J., Jr.; Richardson, D. L. (Procter & Gamble Co.)
United States Patent 4 268 738 (1981) [En]

Microwave moderator is described for partially attenuating and/or modifying microwave energy to achieve, for instance, more uniform cooking of comestible articles in microwave ovens. Packages, bags, and wraps are described which comprise such microwave moderators and which enable microwave cooking of frozen foods at relatively high microwave oven power levels without requiring precooking, defrosting or oven power level changes. Such a moderator may comprise an array of alternately disposed or spaced areas of microwave reflective material, and complemental-shape microwave transparent zones, e.g. a wrap comprising a perforated sheet of microwave reflective material such as Al foil. AS

14

Microwave proofing and baking bread utilizing metal pans.
Schiffmann, R. F.; Mirman, A. H.; Grillo, R. J. (International Telephone & Telegraph Corp.)
United States Patent 4 271 203 (1981) [En]

Method for proofing and baking bread in metal pans using microwave energy is described. Overall proofing and baking time are reduced by a method combining conventional and microwave proofing of the bread loaves prior to conventional and microwave baking. Significant reduction in processing time results when the bread is conven tionally and microwave proofed and conventionally and microwave energy baked. AS

15

Bread baking process.
Lefeuvre, S.
British Patent 1 583 182 (1981) [En]

Described bread baking process is accelerated by brief prebaking in a microwave oven of specified parameters. IFT

16

Scanning electron microscopy, proteolytic enzyme activity, and acceptability of beef *semitendinosus* cooked by microwaves and conventional heat.
Hutton, C. W.; Neggers, Y. H.; Love, T. O.
Journal of Food Science 46 (5) 1309–1314, 1319 (1981) [En] [Dep. of Food, Nutr. & Institution Management, Univ. of Alabama, Alabama 35486, USA]

Beef *semitendinosus* muscles cooked by conventional heat and microwave energy to endpoint temp. of 40°, 50°, 60°, and 70°C were evaluated for structural (scanning electron microscopy, SEM) changes, enzyme activity, and shear value. The 70°C samples were evaluated by a sensory panel. As endpoint temp. increased, there were concomitant increases observable by SEM in intermyofibrillar spaces, fibre fragmentation, and occurrence of nonfibrous connective tissue. At 70°C, microwave samples were more fragmented, flattened, and coagulated than the conventional samples. Generally, enzyme activity of the muscle and drip decreased as endpoint temp. increased. Conventional samples received higher sensory scores than microwave samples. IFT

17

Effect of microwave heating of soybeans on protein quality.
Sanchez, A.; Register, U. D.; Blankenship, J. W.; Hunter, C. C.
Archivos Latinoamericanos de Nutricion 31 (1) 44–51 (1981) [13 ref. En, es] [Univ. de Montemorelos, Montemorelos, Nuevo Leon, Mexico]

Studies were conducted on the effects of microwave cooking of soybeans (a blend of the Amsoy, Corsoy and Besson var.) on the proximate composition and nutritional value of soybean meals prepared therefrom. Samples prepared from soybeans heated at temp. over the range 95–137°C were studied. Proximate compositions of meals from raw and heated beans resp. were (%): protein (N × 5.71) 36.3 and 37.2; fat 22.1 and 23.1; ash 4.1 and 4.6; fibre 3.9 and 3.9; carbohydrate 26.1 and 25.9; and moisture 7.5 and 5.5. Feeding trials with weanling male Sprague-Dawley rats showed microwave-cooked samples to have significantly higher protein efficiency ratio and give higher wt. gain than raw samples; this improvement in protein nutritional value increased with increasing intensity of heat treatment. PER was similar for casein and for the soybeans subjected to the most intensive heat treatment. AJDW

18

Baking high-ratio white layer cakes with microwave energy.

Martin, D. J.; Tsen, C. C.

Journal of Food Science 46 (5) 1507–1513 (1981) [En] [Dep. of Grain Sci. & Ind., Kansas State Univ., Manhattan, Kansas 66506, USA]

Microwave energy was evaluated as a means of baking high-ratio white-layer cakes by considering the effects of various processing conditions and amounts of ingredients. Min. water in cakes baked with microwave energy did not result in surface collapse as with cakes baked by conventional means. As the amount of monocalcium phosphate monohydrate in the baking powder blend was increased, vol. and specific vol. decreased and crumb firmness and internal score increased. There was no evidence of any significant internal nor surface batter flow in the conventional cake, while in the microwave cake considerable batter flow was observed on the surface and internally in the upper central regions of the cake. Scanning electron micrographs showed differences in cell structure between both types of cake. The cells in the centre of the cake baked with microwave energy were more irregular and had thicker cell walls than the conventional cake. IFT

19

Microwave heating of scrambled eggs in a hospital foodservice system.

Cremer, M. L.

Journal of Food Science 46 (5) 1573–1576, 1581 (1981) [En] [Ohio State Univ., School of Home Economics, 1787 Neil Avenue, Columbus, Ohio 43210, USA]

Temp. of scrambled eggs (117 portions) after heating in microwave ovens in a hospital foodservice system were examined to determine the extent to which temp. could be controlled in actual foodservice operation, and the relationship of voltage, portion wt., temp. before heating, and power (W) within ovens to temp. of food after heating in actual operation. Temp. variability was controlled to the extent of 5°C (average 2 scoops), as indicated by the s.d., with 96% of the temp. ≥74°C as indicated by standard score conversion. Significant ($P < 0.01$) negative correlation was found between temp. of eggs after heating and voltage; this occurred within a range of 3 V. Temp. after heating was significantly ($P < 0.01$) positively correlated with temp. before heating and negatively correlated with portion wt. ($P < 0.05$). No significant relationship was found between temp. and power (W) within ovens but voltage was significantly ($P < 0.01$) negatively correlated with power. Food may be heated in microwave ovens in foodservice systems if factors influencing heating are rigidly controlled, but complete safety cannot be assured. IFT

20

Sensory characteristics of postmortem papain injected turkey cooked conventionally or by microwaves.

Chambers, E., IV; Bowers, J. A.

Journal of Food Science 46 (5) 1627–1628 (1981) [En] [Dep. of Foods & Nutr., Kansas State Univ., Manhattan, Kansas 66506, USA]

Sensory characteristics of papain-injected turkey breast muscle cooked in microwave or conventional ovens were evaluated by a panel. Off-flavour and mealiness developed in intact turkey muscles injected with papain, but those levels of papain were not sufficient to tenderize the muscle. Samples cooked in conventional ovens had greater roast turkey flavour and were less juicy than samples cooked in microwave ovens. IFT

21

Method and apparatus for cooking.

Green, R. E.

United States Patent 4 272 663 (1981) [En]

Method and apparatus are described for cooking individual cuts of meat, such as rib steaks and prime rib, in a microwave oven. The implement comprises a rectangular base of a thermoplastics sheet, e.g. plexiglass, with a post in each corner. The implement also includes a rectangular floating member of plexiglass with apertures in each corner; these apertures slide over and receive the posts on the base. The individual cut of meat is positioned on the implement base and the floating member floats downwards on the posts until it is resting on the cut of beef. When in operative position, the floating member permits cooking of the cut of beef around the outer edges leaving the centre warm but rarer than its outer edges; degree of cooking is determined by its time in the microwave oven. In a modification enabling a number of cuts of beef to be simultaneously cooked a number of floating members are used, some of which also function as bases for the cuts of beef. AS

22

Ultrastructural changes in pre- and post-rigor beef muscle caused by conventional and microwave cookery.

Hsieh, Y. P. C.; Cornforth, D. P.; Pearson, A. M.

Meat Science 4 (4) 299–311 (1980) [27 ref. En] [Dep. of Food Sci. & Human Nutr., Michigan State Univ., East Lansing, Michigan 48824, USA]

Studies were conducted on bovine *sternomandibularis* muscle in 4 initial states (pre-rigor, cold-shortened, in rigor, and cold-shortened then marinated in 8% $NaHCO_3$ solution), either raw or cooked by 3 methods: (i) microwave-cooked; (ii) boiled or (iii) roasted. Samples were examined by both scanning and transmission electron microscopy. Electron micrographs are presented, and the results are discussed. All cooking methods gave supercontraction nodes and tearing and fragmentation of pre-rigor muscle; this effect was less marked with (i) than with (ii) or (iii). All cooking methods also gave supercontraction bands and tearing with cold-shortened muscle; (i) gave a more uniform repeating pattern of small stretched areas alternating with dense contracting areas, unlike the massive contraction bands and extensive torn and fragmented areas with (ii) and (iii). All cooking methods gave myofibrillar protein coagulation and shrinkage of in-rigor muscle, so that structure was largely obscured; however, (i) tended to give smaller changes than (ii) or (iii). $NaHCO_3$-marinated muscle showed no supercontraction after cooking, although occasional breakage was observed near the Z line of (ii) and (iii)

samples. Myofibrils appeared fused in all cooked bicarbonate-marinated samples. (i) gave least damage to the fine structure of the connective tissue.

Occurrence of considerable fibre kinkiness in uncooked muscle samples was observed. Results are discussed in detail, with special reference to their relation to tenderness of meat. AJDW

23

Effect of cooking rates in electric or microwave oven on cooking losses and retention of thiamin in broilers.

Hall, K. N.; Lin, C. S.

Journal of Food Science 46 (4) 1292–1293 (1981) [10 ref. En] [Dep. of Nutr. Sci., Univ. of Connecticut, Storrs, Connecticut 06268, USA]

A study was conducted to determine the effect of 2 microwave oven and 2 electric oven cooking rates on retention of thiamin and cooking losses with broiler chickens. Thiamin was determined by a microbiological turbidimetric assay of raw and cooked meats. Broilers cooked in the microwave oven retained more thiamin than broilers cooked in the electric oven. There was no difference in thiamin retention between broilers cooked in the microwave oven at 800 and 1600 W. Broilers cooked in the electric oven at 204°C retained more thiamin than broilers cooked at 121°C. Broilers cooked in a 1600 W microwave oven had the greatest wt. loss. No difference in wt. loss occurred between broilers cooked in an 800 W, 121°C or 204°C oven. IFT

24

Microwave sterilization.

Mitsubishi Monsanto Chemical Co.

UK Patent Application 2 061 085A (1981) [En]

Process is described in which a solid food, e.g. fruit, vegetable, meat or fish is mixed with a liquid, e.g. water, oils or aqueous seasoning solutions, having an elevated temp. in a container which is hermetically sealed and subjected to microwave sterilization. IFT

25

Microwave treatment of food products.

Smith, D. P.

United States Patent 4 289 792 (1981) [En]

Jets of gaseous fluids are directed at foods, so subjecting the surface to very high heat transfer rate. Thus these areas are heated at a proper overall rate for over-all crisping, browning or freezing. The cooking apparatus comprises microwave heating for the produc interior, combined with the described apparatus to direct the air jets at the exterior surfaces of the food product. RAW

26

Container for prepackaging, popping and serving popcorn.

McHam, D. E.

United States Patent 4 292 332 (1981) [En]

An expansible and disposable container is described for popping popcorn (prepackaged with cooking oil) in a microwave oven. The container is made of a material impervious to cooking oil, its upper side has a pattern of weakness that serves as an excess vapour pressure release during the popping and which then permits convenient opening of the container so that the latter can be used as a serving tray. AS

27

[Use of microwave in malt production.] Die Herstellung von Malz mittels Mikrowellen.

Krüger, E.; Groneick, E.

Monatsschrift für Brauerei 34 (5) 173–178 (1981) [8 ref. De] [Versuchs- & Lehranstalt für Brauerei, Seestrasse 13, D-1000 Berlin 65]

Basic principles of microwave heating of foods are briefly discussed. Laboratory scale studies on microwave kilning of malt are described. An experimental kilning unit (capacity 100 g green malt) was constructed; it is described in detail with the aid of a diagram. The malt is kilned for 4 h at an energy input of 60 W, followed by 1 h at 90 W. Comparative data are presented for samples of conventionally-kilned and microwave-kilned malts, including moisture and extract contents, α- and β-amylase activities, nitrosamine concn., Kolbach value, Hartong value, EBC colour value, congress wort pH, and concn. of volatiles and other flavour compounds. The results show that high-quality malts can be made by microwave kilning. Energy balance and economics of the process are discussed. AJDW

28

Comparison of microwave and conventional baking of potatoes in relation to nitrogenous constituents and mineral composition.

Klein, L. B.; Mondy, N. I.

Journal of Food Science 46 (6) 1874–1877, 1880 (1981) [En] [Div. of Nutr. Sci., Cornell Univ., Ithaca, New York 14853, USA]

The effects of conventional and microwave baking on the contents of total and nonprotein N, amino acids, and minerals of potato tuber cortex and pith tissues were investigated. Conventional baking reduced the cortical contents of total N by 4%, the total of total amino acids by 3%, the total of free amino acids by 15%, and K and Fe contents by 15% and 12 %. Conventional baking increased the pith contents of total N by 11%, nonprotein N by 20%, the total of total amino acids by 9%, the total of free amino acids by 8%, and K and Fe contents by 22% and 23%. Microwave baking increased the cortical contents of total amino acids by 2% and free amino acids by 8%, yet reduced the pith contents of total N by 16%, nonprotein N by 18%, total amino acids by 4%, and free amino acids by 17%. Microwave baking had only slight effects on mineral composition. Individual amino acids demonstrated different trends as a result of both cooking methods. IFT

29

Thiamin content, texture, and sensory evaluation of postmortem papain-injected chicken.

Prusa, K. J.; Chambers, E., IV; Bowers, J. A.; Cunningham, F.; Dayton, A. D.

Journal of Food Science 46 (6) 1684–1686 (1981) [En] [Dep. Food & Nutr., Kansas State Univ., Manhattan, Kansas 66506, USA]

Taste panel scores, Instron measurements, and thiamin, fat, and moisture contents from microwave and conventionally cooked roasting chickens, injected with distilled water and papain solution (0.001 and 0.002%) were determined. Moisture, fat, and thiamin contents and cooking losses were not significantly affected by treatment. For papain injected samples, Instron measurements were less than those for uninjected samples when fibres were separated against the grain. Papain injected samples were more tender and mealier than uninjected samples. Roast chicken flavour was unaffected, but off-flavour increased in the papain-injected samples. Generally, cooking methods did not affect sensory scores. IFT

30

Flavor intensity as related to the creatine and creatinine content of microwave and conventionally cooked beef.

Snider, S.; Baldwin, R. E.

Journal of Food Science 46 (6) 1801–1804 (1981) [En]

[Dep. of Food Sci. & Nutr., Univ. of Missouri, Columbia, Missouri 65211, USA]

No relationship between sensory thresholds of panelists for creatine and their ability to detect differences in flavour intensity of beef prepared in a consumer type microwave oven (120 V; 550 W) and a conventional oven was found. The flavour of beef, cooked in an institutional type microwave oven (220 V; 1050 W) was rated more intense than conventionally cooked beef. However, the flavour of beef prepared in a consumer type microwave oven (115 V; 500 W) was evaluated as less intense than conventionally cooked beef. The creatinine content of microwave cooked roasts was greater than conventionally prepared roasts. Correlation between flavour intensity and creatinine content was statistically significant in only one part of this research. IFT

31

[Use of microwaves in the food industry. Studies at the Maua Engineering College.]

Leonhardt, G. F.

ABIA [Associacao Brasileira das Industrias da Alimentacao] No. 51, 8–10, 12–13 (1980) [6 ref. Pt, en]

[Dep. de Eng. Quimica, Escola de Eng., Maua, Brazil]

Aspects considered include costs (capital outlay, operating costs and maintenance costs) of microwave processing, and possible industrial applications evaluated at the Maua Engineering College (use in extraction of juices from tropical fruits; cooking of starchy materials; sterilization of flours; and dehydration of foods). Advantages of microwave processing are considered, together with practical aspects of introduction of industrial-scale applications. AJDW

32

[Use of microwave ovens in catering.]

Filliettaz Goethart R. L. de; Lassche, J. B.

Voeding 42 (12) 407–410 (1981) [Nl]

Aspects considered include: extent of use of microwave ovens in catering; applications for which they are used; disadvantages of microwave heating; efficiency of energy utilization; construction and operation; relation to food quality; cooking losses; elimination of bacteria; effects on nutritional value; and effects on organoleptic quality. AJDW

33

Microwave heating package, method and susceptor composition.

Winters, W. C.; Chang, H.-H.; Anderson, G. R.; Easter, R. A.; Sholl, J. J. (Pillsbury Co.)

United States Patent 4 283 427 (1981) [En]

A microwave heating package, and a method of microwave heating are described. Both the package and the method employ a lossy chemical susceptor, which upon continued exposure to microwave radiation becomes microwave transparent, thus building into the system a unique max. temp. shut off at the point at which the chemical susceptor becomes microwave transparent. The chemical susceptor comprises a combination of a solute, such as inorganic salts of Group IA and IIA, and a polar solvent for the solute, such as water. The chemical susceptor may be composed of a hydrated form of the inorganic salts. The package, method and chemical susceptor may be used for microwave heating of many products, including foods. AS

34

Practical tips from firms, consultant ease creation of microwave foods.

Anon.

Food Product Development 14 (9) 32, 34, 36, 58, 60 (1980) [6 ref. En]

Basic guidelines that include formulation changes, preparation and cooking methods are presented to assist in the adaptation of conventional recipes to microwave use. Aspects considered are: ease of conversion (3 categories: easy-to-adapt, more difficult to adapt, and cannot be adapted); and guidelines for casserole/entrees, vegetables and sandwiches/baked goods (breads, cakes, pies/cookies). VJG

35

Frozen pizza crust and pizza suitable for microwave cooking.

Bone, D. P.; Manoski, P. M. (Quaker Oats Co.)

United States Patent 4 283 424 (1981) [En]

A frozen pizza product for microwave cooking is described, in which the crust comprises a 1st layer of cracker type dough material with moisture content ≤5% and a 2nd layer of baked bread dough type material with moisture content 20–40%; the cracker crust absorbs the vapour phase moisture created during cooking. IFT

36

[Microwave drying for rapid determination of moisture in dairy products.]

Mezzi, G. de; Rogate, R.

Industrie Alimentari 20 (4) 282–284 (1981) [It]

The s.d. and correlation coeff. between the mean of triplicate results with the Evatec 6001 microwave drier (Tecator) and official methods for moisture detn. were 0.232% and 0.992 for 7 ripened cheese samples, 0.309% and 0.992 for 5 processed cheese samples, 0.242% and 0.959 for 4 high-fat margarine and butter samples, and 0.253% and 0.999 for 4 low-fat margarine samples. The Evatec also gave accurate results for a whole milk and a partly skimmed milk sample. The drying time needed was 3–4 min (at power 10) for butter, margarine and milk, and 7–8 min (at power 2–6) for the cheeses. ADI

37

A study of the rapid determination of moisture in cheese by microwave heating.
Shanley, R. M.; Jameson, G. W.
Australian Journal of Dairy Technology 36 (3) 107–109 (1981) [16 ref. En] [Dairy Res. Lab., CSIRO Div. of Food Res., Highett, Victoria 3190, Australia]

A modified domestic microwave oven was used for rapid detn. of moisture in 19 cheese and cheese products, with moisture in the range 16–78%. For 16 of the samples, the results did not differ significantly from those obtained by an Australian Standard reference method [see FSTA (1971) 3 4U215]. Min. heating conditions varied with the type of cheese. Cheddar, for example, required microwave heating for 6 min in an oven previously heated to 45°C. A final 2-min period of resistive heating was used for all products. Results using the new method exhibited greater coeff. of variation, 0.25–1.35%, than those for the reference method, 0.04–0.64%. The method is suitable for simultaneous assay of multiple samples. AS

38

A few minor refinements and Voila! Fast, flavorful microwave food service.
Anon.
Food Product Development 15 (2) 54–55 (1981) [En]

2 Denver restaurants, Zach's and Rick's Cafe, each utilize 6 microwave ovens to prepare all their hot entrees. Both restaurants prepare a few dishes such as soups, but most of their entrees are precooked by their suppliers from recipes developed by the owners. Consideration is given to the way the food supplier worked with the restaurant owner to develop pasta, quiche, club sandwiches, pizza, and chicken dishes suitable for the microwave. It is concluded that increasing microwave use in the food service industry should not require food suppliers to drastically change their products. VJG

39

Cooking container for more efficient cooking in a microwave oven.
Mason, S. I., Jr.
United States Patent 4 286 136 (1981) [En]

A food container is described for efficiently cooking foods in a microwave oven and for serving them. The food is cooked positioned vertically within the oven so that it absorbs both direct microwave radiation and microwave radiation reflected from the walls and floor of the oven. The container can be used to display the food in a store in a vertical position, cook it in a vertical position, and serve it in a horizontal position. It may then be disposed of after one use. The container, comprises thin and flexible plastics or paper board and has an open top. AS

40

Unitized structur for a microwave oven.
White, J. A. (General Electric Co.)
United States Patent 4 282 416 (1981) [En]

41

Microwave oven.
Simpson, J. E. (Amana Refrigeration Inc.)
United States Patent 4 284 868 (1981) [En]

A microwave oven has directional rotating antenna on one wall of a microwave oven cavity of the microwave oven to give circular symmetrical uniform energy distribution of the microwave energy and consistent heating of food products. AS

42

Door lock mechanism of microwave oven.
Ohkado, M. (Sharp KK)
United States Patent 4 288 118 (1981) [En]

43

Bi-rotational microwave oven turntable/rotisserie.
Einset, E.; Hageman, J. R. (Whirlpool Corp.)
United States Patent 4 286 133 (1981) [En]

44

Microwave oven cooking time scale.
Nichols, D. H.
United States Patent 4 276 948 (1981) [En]

A microwave oven cooking time scale is described for predetermining the cooking time for a known amount of food to reach a predetermined temp. AS

45

Temperature measuring arrangements for microwave ovens.
Nakata, T.; Watanabe, T.; Harada, K. (Sanyo Electric Co. Ltd.)
United States Patent 4 286 134 (1981) [En]

An electronic oven is equipped with an IR detector element which detects the temp. of food to be heated without contacting the food. The reflector converges the IR rays from the heat in the oven cooking cavity onto the detector element, the reflector being mounted to cover a plate which has an inlet port to admit the converged rays from the reflector. AS

46

Energy transmission and [uniform] distribution system for a microwave oven.
Kristof, M. J. (Whirlpool Corp.)
United States Patent 4 289 945 (1981) [En]

47

Microwave oven door having a conformable screen [to minimize leakage of microwave energy].
Birk, E. (Litton Systems Inc.)
United States Patent 4 292 488 (1981) [En]

48

Compact microwave isolator.
Green, J. J.; Masse, D. J. (Raytheon Co.)
United States Patent 4 286 135 (1981) [En]

49

Egg cooking in a microwave oven.
Levinson, M. L.
United States Patent 4 280 032 (1981) [En]

A microwave-reflective 1st container limits microwave exposure to the top of a shelled, raw egg contained in it and is covered by a microwave-permeable lid; the 1st container is positioned in a microwave-permeable 2nd container so that the bottom and lower sides of the 1st container contact microwave-lossy liquid contained in the 2nd container. Temp. monitoring, a spoon shaped 1st container bottom, rotation restriction of the 1st container, and methods of using the apparatus to soft and hard cook raw, shelled eggs from both their prefrozen and room temp. states, are also described. AS

50

Use of microwaves to extend shelf life of refrigerated poultry.
Cunningham, F. E.; Francis, C.
Feedstuffs 54 (2) 23–24 (1982) [5 ref. En] [Dep. of Anim. Sci. & Ind., Kansas State Univ., Manhattan, Kansas 66506, USA]

Several experiments are described (graphs and tables included), which studied the effect of subcooking microwave treatments on bacterial load of fresh poultry and poultry products, with special regard to psychrotrophs. Subsequent refrigerated shelf-life of these products was extended by these treatments. Short bursts (20–40 s) of radiation seem to be the most effective in killing psychrotrophic spoilage bacteria e.g. *Pseudomonas* spp., coliforms, *Moraxella acinetobacter, Flavobacterium devorans, Alcaligenes faecalis*, etc., and allowing poultry to be held in the raw state for longer than normal at 4°C. LH

51

Method of cooking thin meats in a microwave oven.
Buck, R. G. (Litton Systems Inc.)
United States Patent 4 281 022 (1981) [En]

Method is described for cooking thin meat in a microwave oven by determining the temp. of the thin meat as a function of humidity and temp. environmental conditions in a microwave oven heating cavity. AS

52

Quantitative and qualitative characteristics of forage- and grain-fed beef and ultrastructure of beef muscle as affected by sample preparation and cookery method.
Thomas, J. D.
Dissertation Abstracts International, B 42 (3) 956: Order no. 8117473, 199pp. (1981) [En] [Univ. of Missouri, Columbia, Missouri, 64201, USA]

Crossbred (Angus × Hereford) steers were used to evaluate the effects of 13 feeding regimes on carcass yield and quality. 48 h after slaughter the carcasses were evaluated for quality and yield grade and sp. gr. Loin steaks and top round roasts removed after 10 days' ageing were evaluated by a sensory panel and for shear values. Other loin steaks were evaluated for colour stability during retail display. Eye of round steaks were used to evaluate effects of fixation treatments and section angle on muscle ultrastructure and effects of microwave and conventional cooking on ultrastructure, residual collagen solubility and shear and compression values. Results included the following: animals receiving corn grain in the diet had higher dressing %, quality grades and yield grades than those receiving no corn grain. Loin steaks from grass-fed steers were darkest in colour, showed the least colour change during retail display, were rated the lowest for sensory attributes, and had the highest shear values. Steaks from silage-fed animals were lightest in colour and were equal or superior in sensory attributes to steaks from steers which had received corn grain. Conventional cooking caused more collagen coagulation than microwave cooking. Steaks cooked by microwave had the highest cohesiveness and lowest chewiness values. JA

53

Microwave heating apparatus with resistive heaters.
Suzuki, Y. (Tokyo Shibaura Denki KK)
United States Patent 4 298 780 (1981) [En]

54

Microwave ovens with programmable control.
Zushi, S.; Oida, Y. (Tokyo Shibaura Electric Co. Ltd.)
United States Patent 4 295 027 (1981) [En]

55

[Possible applications of ultra-high-frequency methods in the food industry.] Möglichkeiten der Anwendung von Ultrahochfrequenz-Verfahren auf dem Lebensmittelsektor.
Mohr, E.; Hanne, H.
Zeitschrift für Lebensmittel-Technologie und -Verfahrenstechnik 32 (5) 217–219 (1981) [9 ref. De] [LEFO Inst. für Lebensmittelforschung- & Untersuchung, Klaus-Grothe-Strasse 33, 2070 Ahrensburg, Federal Republic of Germany]

Use of microwave techniques in the food industry is discussed, with reference to: basic principles; thawing of frozen foods; detn. of moisture in foods; reduction of bacterial counts and elimination of pathogens; melting of chocolate, cheese, etc.; and drying of foods. AJDW

56

Formulating for microwaves.
Przybyla, A.
Processed Prepared Food 150 (3) 86–90 (1981) [En]

The impact of increasing sales of microwave ovens (15% market share in the USA) on the food processing industry is discussed. Consideration is given to the reformulation of products for microwave cooking, the development of special cooking instructions for existing products, and the introduction of totally new foods for microwave oven use. The future of the microwave oven is briefly considered. VJG

57

[Drying of microorganisms in a microwave oven. III. Effect of particle size, product layer thickness and power input on drying of yeast.]
Leonhardt, G. F.; Gomes, A. M. F.
Ciencia e Tecnologia de Alimentos 1 (1) 37–50 (1981) [12 ref. Pt, en] [Dep. de Eng. Quimica, Escola de Eng. Maua, 09500 Sao Caetano do Sul, SP, Brazil]

Studies on microwave drying of yeast *(Saccharomyces cerevisiae)* biomass are described. Variables studied included particle size (mean diam. 0.57, 1.42 or 2.68 mm), product layer thickness (4, 8, 12 or 16 mm) and dryer input power (1.2, 1.4, 1.5, 1.6, 1.8, 2.1, 2.4, 3.0 or 3.6 kW). Tables and graphs are given showing drying performance data. Results are analysed mathematically. Particle size did not influence drying. Drying time decreased with increasing input power. Specific energy consumption was lowest for the thickest product layer. Equations are given for prediction of various drying characteristics. AJDW

58

Corn popper [receptacle for popping corn in a microwave oven].
Wokeck, G. F. (Bangor Plastics Inc.)
United States Patent 4 299 160 (1981) [En]

59

Cooking apparatus.
Okatsuka, H. (Tokyo Shibaura Denki KK)
United States Patent 4 297 568 (1981) [En]

A cooking apparatus, such as a microwave oven, is described. A programme is fed to the device so that the programme is repeatedly used to cook a food always in the same manner. The programme can instruct the oven to cook food for various time periods, as desired. RAW

60

Drive arrangement for microwave oven mode stirrer.
Miller, M. S. (General Electric Co.)
United States Patent 4 296 297 (1981) [En]

61

Controllable-duty-cycle power supply for microwave oven magnetron and the like.
Eichelberger, C. W.; Dehn, R. A.; Wojnarowski, R. J. (General Electric Co.)
United States Patent 4 296 296 (1981) [En]

62

Microwave pie baking.
Levinson, M. L.
United States Patent 4 306 133 (1981) [En]

Apparatus is described for baking meat or fruit pies with full top and bottom crusts while in their metal plates in a microwave oven. The pie is baked in an enclosure containing the pie, in steam generated by the pie, while microwave energy by direct exposure simultaneously bakes the pie's top crust and converts to heat within a microwave-lossy heating element, this being in contact with the metal pie plate, and which bakes the pie's bottom crust. Methods to create superheated steam and trap condensed water within the enclosure are described, together with the microwave-oven and microwave-lossy heating elements made of 2 metal sheets sandwiching a microwave-absorptive material. AS

63

Process and apparatus for continuously separating fat from butter, and the resulting products.
Entremont, J.; Levardon, R. (Entremont SA)
UK Patent Application 2 074 601A (1981) [En]

Molten butter is fed into a microwave treatment unit where it flows in a U-shaped channel whilst being irradiated with microwaves. This causes the separation of the fat from water and proteins with only a small temp. rise of the molten butter. It is claimed from tests that the 'degree of purification' was 99.5% after irradiation for about 1 min with temp. rise of approx. 6°C. The product may then be dried to 99.9% solids and is pasteurized and packaged. FL

64

Microwave attenuation of frozen *Nephrops norvegicus*.
Kent, M.; Stroud, G. D.
Journal of Food Technology 16 (6) 647–654 (1981) [8 ref. En] [Torry Res. Sta., 135 Abbey Road, Aberdeen AB9 8DG, UK]

Effects of chilled storage on the microwave attenuation of frozen scampi were studied in relation to changes in various constituents of the flesh. Correlations were sought between attenuation and N content as well as solids and fat contents. The study is unable to detect regular seasonal variations in these constituents or in microwave attenuation but significant correlations are obtained with changes occurring during chilled storage due to uptake of water. AS

65

Applications of microwave and radiant energies for freeze dehydration of meats. [Lecture]
Arsem, H.; Shults, G. W.; Tuomy, J. M.
Proceedings of the European Meeting of Meat Research Workers No. 26, Vol. I, E-21, pp. 245–247 (1980) [10 ref. En] [Worcester Polytechnic Inst., Worcester, Massachusetts, USA]

Studies on application of microwave heating in freeze-drying of meat are described; an experimental microwave/radiant heating unit (capacity 7 kg product) was used. This system gave more rapid drying than radiant heating alone. Dehydration occurred at a faster rate than predicted, implying a reduction in the energy required to sublimate the ice. This phenomenon is discussed, with reference to possible entrainment of partially sublimated material in the vapour flux. Implications for freeze-drier design are considered. [See FSTA (1982) 14 8S1379.] AJDW

66

Effect of microwave heating in cook/chill food service system.
Dahl, C. A.; Matthews, M. E.; Lund, D. B.
Journal of the American Dietetic Association 79 (3) 296–301 (1981) [14 ref. En] [Dep. of Food Sci., Univ. of Wisconsin-Madison, Wisconsin, USA]

Investigations were carried out to determine the quantity and the utilization of energy required to microwave heat portions of beef loaf using mass and energy balances in an energy-accounting model. Beef loaves (1 kg size) prepared during 3 laboratory simulations of a cook/chill system, were: baked to mean internal end temp. of 69 ± 4°C in a convection oven operating at 156 ± 5°C; covered and stored chilled at 6 ± 1°C for 24 h; sliced into 100 g portions; and microwave heated for 80 s to an internal end temp. of 82 ± 9°C. Mean input power to the microwave oven was 240 kJ/80 s. 53% of this was used to operate the oven, 12% to heat the beef loaf, 17% was estimated to evaporate water from the beef loaf and 18% was attributed to miscellaneous energy losses. VJG

67

[The wave that cooks.]
Bei, A. dei; Lovotti, -.
Ristorazione Collettiva 7 (1/2) 65–75 (1982) [7 ref. It]

Microwave cooking is discussed, with reference to: characteristics of microwaves; interaction of microwaves with various materials: basic principles of microwave ovens; control and safety measures; characteristics of microwave ovens for use in catering; application of microwave ovens in catering; potential energy savings; possible future developments; and safety. AJDW

68

Heat treatment of heat-sensitive products.
Stenstrom, L. A. (Alfa-Laval AB)
United States Patent Reissue 30 780 (1981) [En]

Separate units of a heat-sensitive food product are each pretreated by heating at least the main part of the unit to a pre-heating temp. of ≥50°C, with a cooling medium being brought into direct or indirect contact with the unit so that its surface layer is prevented from acquiring a substantially higher preheating temp. than its internal part. Each product unit is then heated to sterilizing or pasteurizing temp. by electro-magnetic energy of at least microwave frequency. [From En summ.] RAW

69

Sensory quality and energy use for scrambled eggs and beef patties heated in institutional microwave and convection ovens.
Cremer, M. L.
Journal of Food Science 47 (3) 871–874 (1982) [En] [Ohio State Univ., 1787 Neil Ave., Columbus, Ohio 43210, USA]

Scrambled eggs (96 portions) and beef patties (96 portions) were heated in institutional microwave and convection ovens to determine energy use in heating and sensory quality of food. For both products, significantly ($P < 0.01$) more energy (BTU) was used for heating in the convection than in the microwave oven, and respective amounts (BTU) were 28 658.7 and 9385.7 for eggs; 31 313.3 and 9365.0 for beef patties. All scores for sensory quality were significantly ($P < 0.01$) higher for eggs heated in the microwave than in the convection oven, but for beef patties, scores were higher for all characteristics and significantly ($P < 0.01$) higher for appearance, flavour, and general acceptability after heating in the convection rather than the microwave oven. IFT

70

Carcass finish and breast internal oil basting effects on oven and microwave prepared small toms: cooking characteristics, yields and compositional changes.
Moran, E. T., Jr.; Larmond, E.
Poultry Science 60 (6) 1229–1244 (1981) [21 ref. En] [Dep. of Anim. & Poultry Sci., Univ. of Guelph, Guelph, Ontario, Canada N1G 2W1]

Chilled carcasses from a 12-wk-old flock of Small White toms [male turkeys] were selected to have either an A or B finish but to be equivalent in wt., conformation, and fleshing. One-half of each grade was internally basted in the breast with coconut oil. All treatments were examined raw and after conventional oven and microwave preparation. Basting reduced oven preparation time. Total loss was less by microwave than oven and with high finish as compared to low. Edible yield in terms of commercial parts and meat-skin-bone was greater in B than A carcasses. Moisture of the breast meat was unaffected by grade and basting but decreased with cooking to a greater extent with oven than microwave preparation. More ether extract was found in the raw breast muscle of A than B carcasses and with basting than if not. Oven cooking tended to increase and microwave decrease ether extract of controls relative to raw state. Basting oil was largely lost in the drip upon cooking. Oil retention appeared better with A than B carcasses when oven cooked but the converse occurred by microwave. Overall results question finish as a carcass quality criterion for the consumer, particularly if basted and/or microwave prepared. AS

71

[Use of microwave ovens in catering.]
Fiellettaz Goethart, R. L. de; Lassche, J. B.
Voedingsmiddelentechnologie 15 (5) 13–16 (1982) [Nl, en] [Inst. CIVO-TNO, Zeist, Netherlands]

Aspects considered include: applications of microwave ovens in catering; advantages of microwave ovens; efficiency and performance of commercial microwave ovens; and effects on food quality (covering cooking losses, destruction of bacteria, and effects on organoleptic properties and nutritional value). AJDW

72

[Hygienic studies on polyvinylidene chloride film for cooking by microwave oven.]
Motegi, S.

Journal of Japanese Society of Food Science and Technology [Nippon Shokuhin Kogyo Gakkaishi] 24 (8) 416–419 (1977) [8 ref. Ja, en] [Safety & Environment Dep., Asahi-Dow Ltd., 1-1-2 Yuraku-cho, Chiyoda-ku, Tokyo, Japan]

Tests of microwave cooking procedures with PVDC film (Saran Wrap) at 2450 MHz showed that its use was safe except in the case of contact with edible oil or very fatty foods, when excessive temp. were reached. [From En summ.] JRR

73

Microwave technique for detection of milk powder loss through spray dryer exhaust air.
Sharma, H. S.; Ojha, T. P.; Varshney, N. N.; Mahendra Singh
Journal of Food Science and Technology, India 18 (5) 196–200 (1981) [7 ref. En] [Indian Inst. of Tech., Kharagpur, West Bengal, India]

Absorption of microwaves by dried whole milk, skim milk and infant formulas was studied at 35–85°C and particle sizes 100–205 μm in an experimental set-up at x-band of frequencies (8–12.4 GHz). A sketch of the experimental set up is presented. Microwave absorption for a given particle size decreased with increase in air temp. and in operating frequency. For air temp. 35°, 45°, 55°, 65°, 75° and 85°C the corresponding values for microwave absorption were 0.35, 0.34, 0.33, 0.32, 0.31 and 0.30 dB resp. For particle sizes of 100, 104, 184 and 205 μn the microwave absorption by dried skim milk was 0.35, 0.36, 0.37 and 0.38 dB resp. CFTRI

74

Effects of microwave irradiation on microorganisms.
[Review]
Chipley, J. R.
Advances in Applied Microbiology 26, 129–145 (1980) [77 ref. En] [US Tobacco Co., Nashville, Tennessee, USA]

After a brief introduction to the method of heating used in microwave ovens, information relevant to the effects of microwave irradiation on microorganisms is reviewed. Tests using spores of *Bacillus stearothermophilus* and *Aspergillus niger* irradiated in the absence of water have shown that survival of these 2 spp. when exposed to 2450 MHz microwaves did not differ significantly from that observed in conventionally heated samples. Other experiments confirm that thermal inactivation is the cause of cell death, and that little or no destruction is observed below lethal temp. Microwave irradiation per se does seem to damage cell components, but genetic damage was not evident in *Escherichia coli* mutants irradiated at 10 mW/cm^2 for 30 min. In some experiments, results have been produced which indicate an absence of any effect, thermal or non-thermal, from microwave irradiation of microorganisms. Further research is required to resolve the contradictions implied by such observations. JRR

75

Microwave heating apparatus with cooling conduit.
Yoshimura, H.; Tanaka, J.; Ikeda, N. (Matsushita Electric Industrial Co. Ltd.)
United States Patent 4 314 126 (1982) [En]

76

Microwave steamer.
Bowen, R. F. (Raytheon Co.)
United States Patent 4 317 017 (1982) [En]

Utensil is described for steam cooking in a microwave oven. The bottom portion of the utensil is a microwave transparent dish in which water is placed. A metal pan having a number of holes in the bottom is supported in the dish horizontally aligned with the bottom, spaced above the water level. A tray for holding food is positioned in the pan; the tray may be inverted to provide a second support surface configuration. A metallic cover is supported by the dish to give a microwave choke. The water in the dish is heated by microwave energy into steam which passes through the holes into the cooking region. All of the available microwave energy is absorbed by the water as the food is shielded by the combination of the pan, cover, and the choke between. AS

77

Slot configuration for choke seal [for microwave oven door].
Staats, J. E. (General Electric Co.)
United States Patent 4 313 044 (1982) [En]

78

Microwave oven excitation system.
Fitzmayer, L. H. (General Electric Co.)
United States Patent 4 316 069 (1982) [En]

79

Combination microwave oven and exhaust vent and installation mounting method therefor.
White, J. A.; Rice, F. L. (General Electric Co.)
United States Patent 4 313 043 (1982) [En]

80

Power controlled microwave oven.
Buck, R. G. (Litton Systems Inc.)
United States Patent 4 317 977 (1982) [En]

Methods and apparatus are described for controlling the food cooking time in a microprocessor controlled microwave oven in response to remotely sensed condition of the food being heated. The average food temp. is constantly derived during cooking, utilizing data entered by the user on food category, initial mass, and the measured input power to the magnetron. [From En summ.] RAW

81

Error alarm system in a microwave oven.
Doi, K.; Kashiwagi, T. (Sharp KK)
United States Patent 4 309 585 (1982) [En]

A microwave oven comprises a digital control circuit for controlling microwave generation, and a multi-digit digital display unit for displaying a cooking condition. A display control signal is developed when a cook start switch is actuated before an oven door is tightly closed; in response to the signal, there is an alarm display, for example, DOOR, on the digital display unit. The multi-digit display unit also has another alarm display, for example, PROBE if the cook start switch is actuated when the food temp. sensor probe is not placed in its operative condition, even though the food temp. control mode of operation is selected. AS

82

High frequency heating apparatus.
Noda, T. (Tokyo Shibaura Denki KK)
United States Patent 4 317 976 (1982) [En]

A high frequency heating apparatus has a cooking card, and where a cooking programme indicating a power level [PL] corresponding to a specified cooking time and a PL corresponding to a prescribed food temp. is preset in the card; the data in the cooking card read by a reading device are stored in a corresponding memory unit; cooking is performed at a PL read from the memory unit; and the cooking time and corresponding PL, or food temp. and corresponding PL, are indicated on a display device. AS

83

Cookware with liquid microwave energy moderator.
Prosise, R. L.; Leveckis, A. S.; Gunn, C. L.
United States Patent 4 316 070 (1982) [En]

A moderator for cooking foods evenly in a microwave oven is described. The moderator is in the form of an enclosure having a fluid impervious outer layer. Attached to the inside surfaces of the outer layer is a liquid film forming layer which converts a dielectric fluid placed in contact with the layer into a thin liquid film which surrounds the cooking comestible. AS

84

Glass could be convenience package of microwave era.
Andres, C.
Food Processing 42 (3) 82–83 (1981) [En]

Glass manufacturers have examined the suitability of glass jars for packaging shelf-stable foods which are later heated in domestic microwave ovens. Results indicate that the standard glass jar is transparent to microwaves, labels may be left in place during heating (and foamed polystyrene labels facilitate removal of the hot jar), the glass jar does not affect distribution of microwaves in the oven, and the jar may be reused after microwave heating. JRR

85

Studies on microwave processing of rapeseed.
Maheshwari, P. N.
Dissertation Abstracts International, B 42 (3) 955 (1981) [En] [Univ. of Guelph, Guelph, Ontario, Canada]

Various studies on rapeseed (*Brassica napus* cv. Tower and *B. campestris* cv. Candle) and mustard (*B. juncea*, oriental mustard) are reported. These studies involved: quantitation of 5-vinyloxazolidine-2-thione and allyl-, butenyl- and pentenyl-isothiocyanates by HPLC; thermal decomposition of sinigrin (allyl glucosinolate) in aqueous and model systems; microwave treatment of dehulled seeds to inactivate myrosinase (thioglucoside glucohydrolase) and its effect on oil and meal quality; examination of changes in seed microstructure upon treatment with microwave energy; and localization of myrosinase activity in cotyledon cells by cytochemical and biochemical procedures. The study of microwave treatment of dehulled seeds indicated that the treatment required to inactivate myrosinase did not adversely affect the colour of meals or the colour and S content of oils. Microstructural changes resulting from microwave treatment were found to be a function of the extent of heating and included coalescence of oil droplets and distortion of aleurone grains. JA

86

[Studies on dehydration of Welsh onion (*Allium fistulosum* L.) and carrot (*Daucus carota* L. var. *sativa* D.C.) by microwave.]
Kamoi, I.; Kikuchi, S.; Matsumoto, S.; Obara, T.
Journal of Agricultural Science [Tokyo Nogyo Daigaku Nogatu Shuho] 90th Anniversary Edition, 150–168 (1981) [4 ref. Ja, en] [Lab. of Food Sci. & Tech., Dep. of Agric. Chem., Tokyo Univ. of Agric., Tokyo, Japan]

Onions and carrots were dried by microwave irradiation after pretreatment with hot air blast, and the products compared to those of more traditional drying procedures, i.e. freeze-drying, hot air blast drying, and vacuum drying. Water absorption levels were lower in microwave dried onion, and highest in freeze-dried carrot. Tast panel assessment of onion showed the freeze-dried product to be softer than the microwave dried one. The colour of onion was affected by the drying temp.; the colour of the microwave product was similar to that of air-blast dried at 80°C, and that of the freeze-dried product to that of air-blast dried at 60°C. There were few differences in colour between drying methods for carrot, but blanching did alter the colour. Volatile flavouring substances were studied by GLC, and the tissue structure of the dried materials examined by scanning electron microscopy; the latter revealed a greater degree of shrinkage in the microwave dried samples of both vegetables. [From En summ.] JRR

87

Improved cooking method and apparatus.
Maxton, K. S. (ABR Food Machinery Co.)
British Patent 1 603 617 (1981) [En]

Process is described in which food items, e.g. chicken pieces, are conveyed through a tank of heated cooking oil while being subjected to microwave radiation. The microwave speeds up the cooking process and allows > ½ the total energy requirement to be in a cheap form e.g. gas. RAW

88

Survival of bacteria in food cooked by microwave oven, conventional oven and slow cookers.
Fruin, J. T.; Guthertz, L. S.
Journal of Food Protection 45 (8) 695–698, 702 (1982) [7 ref. En] [Toxicol. Group, Letterman Army Inst. of Res., Presidio of San Francisco, California 94129, USA]

To assess the destructive effect of different cookery methods on bacteria, strains of *Escherichia coli, Clostridium perfringens, Streptococcus faecalis* and *Staphylococcus aureus* were used to inoculate a meatloaf preparation. After inoculation, a sample was withdrawn for bacterial analysis and the remainder of the meatloaf was divided and cooked by microwave oven, conventional oven or slow cooker. The temp. of the meatloaf was recorded at various locations immediately after cooking to obtain min., max. and mean temp. for each loaf. Also, just after cooking, representative samples were analysed by conventional means for the specific bacteria and for total bacterial content. Survival % were calculated and plotted against temp. for each cooking method. Temp. variation within the loaf was greatest for those cooked with microwaves and smallest for those cooked by the slow method. For each bacterial strain and the total count, the destructive effect of cooking method was not different at the 0.05 level of significance. AS

89

Cooking utensil [combined microwave and electric heating] controlled by gas sensor output [for gas generated by the foods being cooked].
Tanabe, T. (Sharp KK)
United States Patent 4 311 895 (1982) [En]

90

Microwave oven with rotating multiport radiator.
Weiss, B. J. (Raytheon Co.)
United States Patent 4 314 127 (1982) [En]

A combination electric heat and microwave oven employs a common cavity for cooking food with either microwave energy, electric resistance heating, or both, through a rotating multi-port radiator. AS

91

Door latch interlock system for microwave oven.
Kristof, M. J.; Schwaderer, J. R. (Whirlpool Corp.)
United States Patent 4 321 445 (1982) [En]

92

Microwave oven employing a gas sensor.
Tanabe, T.; Nakagawa, H.; Fujihara, T. (Sharp KK)
United States Patent 4 319 110 (1982) [En]

Microwave oven includes a gas sensor to detect the concn. of gas developed from a food in an oven cavity. When the cooking operation reaches the desired level, the gas concn. reaches a preselected level and an output signal of the gas sensor shows a predetermined output level at which the microwave generation is terminated. A detection circuit detects abnormally high resistance created in the gas sensor due to, e.g. disconnection of a warming heater included in the gas sensor; if an abnormal condition is detected microwave generation is terminated and an alarm is displayed. AS

93

[Dangerous equipment?]
Berteaud, J.
Alimentation No. 79, 81–82 (1980) [Fr]

Possible dangers to operatives of use of microwave ovens are surveyed. Standards in Western countries established a max. limit of 1–5 mW/cm^2 in areas where humans could be exposed. Losses of microwaves from properly maintained modern ovens are considered negligible; importance of the oven door as a barrier to microwave leaks is discussed. DIH

94

Cooking utensil for uniform heating in microwave oven.
Dehn, R. A. (RTE Corp.)
United States Patent 4 320 274 (1982) [En]

A continuous conductor pattern on a dielectric cooking utensil improves distribution of microwave energy to the bottom surface of the food being cooked. The energy is coupled from the electromagnetic field within the oven cavity by metal strip pickup probes on the hand grips or side walls, which are part of the embedded metal layer. The conductor pattern on the bottom wall couples energy from the pickup probes to the central region of the utensil. AS

95

Microwave oven with resistance heating unit.
Reiss, W. (Licentia Patent-Verwaltungs GmbH)
United States Patent 4 320 275 (1982) [En]

A microwave oven has a cooking chamber with a microwave window covered by a glass-ceramic plate with an interposed seal. A microwave connecting housing joins on the window externally of the cooking chamber. A microwave generating and guiding device bounds (at least) in part the space defined by the connecting housing to direct microwave energy into the cooking chamber; additionally an electric resistance heater is arranged in the cooking chamber. Air inlet openings connected to the space defined by the connecting housing for introduction of pressurized air, generate air pressure in the connecting housing to prevent cooking vapours etc. from reaching and soiling the microwave generating and guiding components. AS

96

Cooking utensil controlled by gas sensor output and thermistor output.
Tanabe, T. (Sharp KK)
United States Patent 4 316 068 (1982) [En]

A combined microwave and electric heating oven comprises in an exhaustion duct a gas sensor to detect exhaustion gas concn. and a thermistor to detect exhaust air temp. A control circuit receives output

signals from the gas sensor and the thermistor to terminate cooking when both the exhaustion gas concn. and exhaust air temp. exceed preselected reference levels. AS

97

Performance of a liquid-crystal microwave oven leakage indicator.

Voss, W. A. G.; Turner, R.

Journal of Microwave Power 17 (1) 39–49 (1982) [18 ref. En] [Dep. of Electrical Eng., Univ. of Alberta, Edmonton, T6G 2N7, Canada]

98

[Electrical cooking apparatus, involving consecutive application of IR rays and microwaves.]

Bellavoine, R. (France, Societe Francaise d'Application des Micro-Ondes (SFAMO)

French Patent Application 2 482 706 (1981) [Fr]

A chamber contains an IR heating element in ≥ 1 zone and a microwave source in another zone with internal metal walls. A carriage moves products, e.g. foods, from 1 zone to the other. The carriage picks up the material to be cooked and exposes it to IR rays, while it is in the 1st zone; when it is in the 2nd zone, its own metal walls and those of the chamber form a defined microwave compartment, containing the material to be cooked; this sealed off compartment prevents microwave emission to the 1st zone and to the outer chamber walls. W&Co

99

The development of microwave power applications in China.

Chen Han-Kui; Shen Zhi-Yuan; Fu Chen-Seng; Wu Ding

Journal of Microwave Power 17 (1) 11–15 (1982) [3 ref. En] [Microwave Res. Lab., E. China Normal Univ., Shanghai, China]

A summary of the principal applications and research activities concerning CW magnetrons as used in China is presented, including a section on food processing. Several factories are using microwave heating to process foods, i.e. dry chocolate powder, dry milk cake for babies, and acceleration of ageing of new wines and spirits. LH

100

[Microwave reheating of frozen precooked beef patties.]

Zlender, B.; Dragnev, M.; Buchar, F.; Satler, M.

Tehnologija Mesa 22 (6) 169–172 (1981) [8 ref. Sh, en] [Univ. E. Kardelja, Katedra za Tehnologiju Mesa, Ljubljana, Yugoslavia]

Beef patties were prepared from ground beef chuck with 5, 15 and 25% beef fat and 1.5% EMHV emulsifier. They were precooked, chilled, vacuum packed and refrigerated and stored at −25°C. Frozen samples were reheated in a microwave oven to a temp. of approx. 70°C. Sensory and analytical tests showed that beef patties containing 15% beef fat had the best appearance, juiciness, flavour and consistency. Precooking to different temp. (55°C and 65°C) did not affect the consistency of reheated patties. STI

101

Thiamin and riboflavin content of flake-cut form pork roasts.

Thomas, M. H.; Decareau, R. V.; Atwood, B. M.

Journal of Microwave Power 17 (1) 83–87 (1982) [14 ref. En] [US Army Natick Res. & Development Natick, Massachusetts 01760, USA]

Pork, prepared by the flake-cut process was cooked at 300 W in a microwave oven. Thiamin and riboflavin contents were determined in the raw and cooked samples. Comparisons were made with similar roasts cooked in conventional and convection ovens. Pork roasts prepared in a microwave oven at low power retained much thiamin as when cooked in conventional electric ovens. Conversely, riboflavin was lost to a greater extent in the microwave oven than in conventional ovens. The data show that microwave cooking at reduced power levels can result in thiamin retention equal to that in other cooking procedures. AS

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40. Arsenic in Foods	□ £10.00	□ £6.00	□ £10.00
41. Ascorbic Acid	□ £10.00	□ £6.50	□ £11.00
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